8 ATTACHMENT 5 - WORK PLAN

For the “AttachmentName” in the naming convention of BMS, use “WrkPln” for this attachment.

The work plan must be consistent with and support the budget and schedule. The level of detail must be sufficient for the work plan to function as the scope of work for the agreement and to allow reviewers to understand the level of effort of the work being performed as to further substantiate the cost estimates in the budget. If the applicant does not have an existing GWMP, then it should use this section to detail the process by which one will be created. The work plan should include, at a minimum, the following items:

- Scope of the proposed project including (as appropriate) maps of agency area and area of proposed tasks;
- Specific purpose, goals, and objectives of the proposed project related to improving groundwater management and implementing the GWMP and/or where applicable the IRWM Plan;
- Work items to be performed under each task of the proposed tasks (consistent with the budget and schedule);
- Present a sound strategy for evaluating progress and performance at each step of the proposed project.
- Project deliverables for assessing progress and accomplishments, which include quarterly progress and final reports.
- If access to private property is needed, provide assurance that access can be granted. For example, if wells will be constructed or sampled on private land, submit a letter or agreement that demonstrates that access for well construction and monitoring on the property has been obtained..
  Explain the plan for environmental compliance and permitting, including a discussion of the following items: a description of the plan, proposed efforts and approach to environmental compliance, including addressing any CEQA obligations in connection with the proposal; a listing environmental related permits or entitlements that are description of the plan, proposed efforts, and approach to environmental compliance, including addressing any CEQA obligations in connection with the proposal; a listing environmental related permits or entitlements that are needed for the project; and any other applicable permits that will be required.
  Briefly describe the process and schedule for securing each permit/approval. Discuss necessary local drilling permits and the submittal of Well Completion Reports to DWR. Describe the proposed process for securing each environmental permit and any other regulatory agency approval needed for the project; and any other applicable permits that will be required. Briefly describe the process and schedule for securing each permit/approval. Discuss necessary local drilling permits and the submittal of Well
- Completion Reports to DWR. Describe the proposed process for securing each environmental permit and any other regulatory agency approval. Description of

the plan, proposed efforts, and approach to environmental compliance, including addressing any

8.1 Scope of the Proposed Project

A presentation of the Goals and Objectives of the Proposal.

The 2012 PIXID Groundwater Banking Support Project (Project) is an effort to further development of a project that will address a major groundwater management need within PIXID. The Project involves the development of a numeric groundwater model covering 36 square miles centered on the future groundwater bank, 20 existing private or adjacent to agricultural wells that will be added to the District's groundwater monitoring network within the groundwater model area and two new dedicated groundwater monitoring wells adjacent to the proposed groundwater banking site.

PIXID has been developing and evaluating the proposed DEID-PIXID Groundwater Banking project for the last few years and has determined that it holds significant promise for the District to improve groundwater management and conditions within the District. Since 2008, PIXID and DEID have undertaken a Reconnaissance Study for the project, have developed a project financial model, have developed a groundwater conceptual model and have developed the needed water balance information to develop a numeric groundwater model. In 2011, the District completed a System Optimization Review Study funded by the Bureau of Reclamation that confirmed that the DEID-PIXID Groundwater Banking project was one of the top priority projects for the District. The banking projects location in PIXID is ideal because of the sandy conditions near Deer Creek and the storativity of the aquifer within PIXID. The banking project is anticipated to have a 100,000 acre-foot storable maximum and be able to recharge and recover a maximum of 30,000 acre-feet per year. The banking project has the potential to develop new groundwater recharge facilities for PIXID, to generate a new "leave-behind" supply of water that benefits the District's groundwater resources, and generate a revenue stream that the District can use to purchase additional surface water and to develop additional conveyance and recharge projects.

The proposed groundwater bank is located on the north side of Deer Creek at the approximate intersection of Tulare County Road 156 and Avenue 44 alignments. The 2012 PIXID Groundwater Banking Support Project will evaluate the proposed project through a numeric groundwater model and estimate the benefits and impacts of the project. The Project will also take steps to develop additional baseline data in the groundwater bank area through the inclusion of 20 existing wells into the District's

groundwater monitoring network and the development of two new dedicated monitoring wells.

8.2 **Proposal Purpose, Goals, and Objectives**

Specific purpose, goals, and objectives of the proposed project related to improving groundwater management and implementing the GWMP and/or where applicable the IRWM Plan;

As previously stated in Attachment 4, the overall goals of the Project are to improve Pixley ID's groundwater resource management and knowledge/understanding of the District's groundwater aquifer. The District believes that through the improvements to their monitoring well network and the development of a groundwater model, the District's understanding of local groundwater conditions and the issues that influence them will increase and lead to better informed efforts to manage and improve local groundwater resources.

PIXID believes that these goals of the Project match up well with the goals and objectives of the DCTRA GWMP. On page 1-3 of the DCTRA GWMP there is a list of the highest priority goals for the GWMP. These goals include: 1) Continue to monitor groundwater levels annual during the Spring within the DCTRA by measuring the depth to groundwater of existing wells, 2) Prepare annual map of equal lines of elevation of groundwater and lines of equal depth to groundwater based on field measured data, 3) Publish an updated tabulation of the average depth to groundwater for each participant member for the DCTRA service area, 5) Establish additional groundwater recharge facilities for groundwater banking, and 7) Investigate potential groundwater banking opportunities, and continue to monitor and evaluate existing groundwater banking project. Further on page 3-1 of the DCTRA GWMP there is a list of best management objectives to help orivde a more reliable groundwater supply. These objectives include: 1) To promote and realize groundwater resource protection, 2) To facilitate groundwater resource sustainability, 3) to develop groundwater resource understanding, 4) to develop groundwater basin understanding, and 5) to promote and facilitate information dissemination regarding the groundwater resource.

The District's groundwater monitoring network is made up of 37 privately owned agricultural wells that are monitored twice a year (spring and fall) through agreements with cooperating landowners. The District participates with other adjacent districts to periodically map groundwater levels in the area, but the number of wells within the District only allows a certain level of detail. Pixley ID encompasses approximately

69,500 acres and the current 37 monitor wells each represent approximately 1,880 acres or 2.9 square miles. The District intends to improve their existing groundwater monitoring well network through the addition of several existing landowner wells in the southeastern portion of the District where their current coverage is somewhat sparse. Also the District intends to develop their first two dedicated groundwater monitoring wells and outfit them with data loggers that can collect monthly readings throughout the year. This data will be considerably increase the information available to the District and others concerning groundwater conditions throughout the year.

The general goals and objectives of the groundwater monitoring program are to provide the District Board of Directors, staff, land owners, growers and the public information about local groundwater conditions. The specific goals for the groundwater monitoring wells include:

1. Establish a baseline for future monitoring;
2. Fill gaps in District-wide monitoring network;
3. Better defining local groundwater conditions throughout the year;
4. Use monitoring data in part to compute groundwater stored and withdrawn;
5. Provide data needed for graphical, semi-analytical or computer model analysis of groundwater conditions; and
6. Increase groundwater level data in an area lacking data in the statewide network.

The expansion of the groundwater monitoring network will increase the reliability of the District's monitoring effort, will promote groundwater resource protection, will develop groundwater resource understanding, and will promote and facilitate information dissemination regarding groundwater resources.

The District's goals and objectives through the development of the two new dedicated monitoring well will be to plan, design and install two depth-discrete monitoring wells, evaluate the findings from their installation and present the findings in a report, as well as install data loggers for long term groundwater level monitoring in 96 locations. The wells will provide benefits to District-wide groundwater monitoring, and localized benefit to District's effort to analyze the potential for a new groundwater banking facility. These two groundwater monitoring wells will become the first two monitor wells of several that will eventually be developed to monitor the groundwater banking project and better ?? generally to help manage the region's groundwater.

The development of two new dedicated monitor wells will increase the reliability of the District's monitoring effort, will promote groundwater resource protection, will develop

groundwater resource understanding, and will promote and facilitate information dissemination regarding groundwater resources.

The District has been pursuing the development of a groundwater model for a potential groundwater banking project in the southeast part of the District. The potential groundwater bank would be located along Deer Creek and would use the existing cone of depression on the east side of the District to store imported water supplies for banking partners. The District would benefit from the potential groundwater banking effort through contractual amounts of seepage left behind as well as finances to purchase additional surface water and develop additional surface water delivery and groundwater recharge facilities[2]. The District has funded the compilation of the needed information and estimates to develop a numerical groundwater model for the potential project area over the period of 1995 – 2006. The District's goals and objectives through the development of the groundwater model are:

1. To develop an numerical groundwater model that will reasonably (within industry standard tolerances) estimate recharge and extraction impacts within a 2.5 mile radius around the groundwater banking project;
2. To develop a new analytical tool that will help the District optimize the potential benefits in a new groundwater management effort;
3. To develop information to help better inform landowners in the project area about the benefits and impacts of the banking project;
4. To engage interested parties and present information on benefits and impacts developed through the numeric model to the PIXID Board of Directors, impacted landowners, and incorporate this information as pertinent into future environmental documents for the project;
5. To develop an analysis of the potential project that can show potential banking partners how we expect the facility to possibly operate and what we anticipate local benefits and impacts will be as certain phases of the project are developed;
6. To help further PIXID's groundwater banking project toward facility design, funding and eventual construction and implementation; and
7. To help further the conversion of a significant regional groundwater depression into a usable groundwater bank for PIXID to temporarily store imported surplus water and thereby benefit PIXID's local groundwater conditions.

[2] Pixley ID's current surface water delivery system covers approximately 60% of the District's cropped area and is a significant limitation to the amount of surface water that the District can import to the area.

The development of a numeric groundwater model for a potential groundwater banking project will further the investigation of a potential groundwater banking opportunity, which is one of the highest priority goals listed in the GWMP.

8.2.1.1Purpose and Need

A description of the purpose and need of the Proposal and how it addresses the adopted IRWM Plan's goals and objectives.

The purpose of this proposal is to address the following regional needs:

1. The region has been estimated to be approximately 25,000 AF per year in groundwater overdraft and due to recent consecutive years of below normal rainfall, groundwater levels have further declined;
2. The reliability of groundwater resources needs to be improved both for agricultural users and domestic users (including those in several rural disadvantaged communities) as all users in this region depend on groundwater during times of drought;
3. There are insufficient groundwater recharge facilities to effectively manage and conserve the available wet year surface water; and
4. The groundwater quality available to some disadvantaged communities within the region does not meet all current state standards for domestic drinking supplies and they either require treatment projects to address contaminants or development of alternative sources.

8.3 Work Items to Be Performed under each Task

Work items to be performed under each task of the proposed tasks (consistent with the budget and schedule);

8.3.1.1Direct Project Administration Costs

8.3.1.1.1 Task 1 - Administration

Pixley ID will administer the 2012 PIXID Groundwater Banking Support Project and work to manage and account for all aspects of the Project. Pixley ID staff and consultants will undertake contracting for consulting services needed for the Project; will establish schedules and evaluate the quality of the project work accomplished. This effort will be regularly evaluated at monthly project meetings between the Project Manager, Pixley ID staff working on the project, consultants working for Pixley ID, and selected contractors. At these meetings progress during the previous month will be

reviewed, issues in implementing the Project will be discussed, and action items will be established for the next month.

The District's effort will be to employ qualified professionals to address technical issues within their areas of expertise to obtain the best data and evaluation of that data possible. It is the intention of the District to use regular project team meetings as a tool to receive updates on project progress, identify tasks that are not proceeding according to the project schedule and why they are not, identify means to address the issues delaying project tasks and document project progress, project management decisions and the status of expenditures versus the project budget.

All consultant contracts will include detailed project schedules with clearly defined milestones and deliverables. Also all consultant contracts will be such that payment will be directly linked to progress on the contractual efforts (time and materials contracts) so as to motivate consultants to proceed as quickly toward the completion of the project as possible.

The entire project will be evaluated through P&P's standard Quality Control process. This project management policy defines specific requirements and expectations of project managers and other team members in the preparation of quality deliverables. In addition, supplemental tools are included to assist implementation of the expected actions. Updates will be provided to the District regarding P&P's internal Quality Control processing and reporting.

Deliverables to DWR – Pixley ID will deliver monthly invoices of work accomplished to DWR. Within these reports pay requests from contractors, certified weekly payroll records, and verifications of prevailing wage compliance will be included.

8.3.1.1.2 Task 2 - Labor Compliance Program

Pixley ID currently does not have a labor compliance program for either the District or for District projects accomplished by contractors. As part of the work in this category Pixley ID will adopt and enforce a labor compliance program pursuant to California Labor Code §1771.5(b). In compliance with California Labor Code §1771.8, Pixley ID's labor compliance program will be in place at the time of contract award for the monitoring well construction.

As part of all work accomplished by Pixley ID, either through contractor or by Pixley ID staff, Pixley ID standard practice is to verify prevailing wage rates for applicable personnel. In contracted situations, Pixley ID requires that contractors and

subcontractors to contractors submit weekly certified payroll. This information is then reviewed and compared to State prevailing wage rates to verify that the appropriate wages and benefits have been paid to employees working on Pixley ID projects. For Pixley ID employees, this is very rarely an issue because Pixley ID compensates their staff at higher than prevailing wage rates. However, whenever there is a construction project undertaken by Pixley ID, these rates are verified by Pixley ID's accounting staff to ensure that appropriate compensation is provided to employees and that Pixley ID fully complies with all portions of the California Labor Code.

Another part of the Pixley ID's standard practice is to verify that all contractors employed by Pixley ID for construction projects are appropriately licensed by the State of California and are in good standing. According to Tulare County ordinance code, only a person licensed pursuant to the Business and Professions Code of the State of California to engage in well drilling who possess an active C-57 contractor's license would be contracted for the construction of a monitoring well.

Further, before commencing work, the contractor shall obtain at his own expense, and agrees to keep in effect during the life of this Contract, as a minimum requirement, the following insurance in a company or companies acceptable to the District. All insurance, excepting Workers' Compensation and Occupational Disease Insurance, shall include as additional insured: the Owner, the State, Provost & Pritchard Engineering Group, and their officers, employees, consultants and agents.

Additional requirements include:

1. Worker's Compensation and Occupational Disease Insurance meeting the statutory requirements of the State in which the work is to be performed;
2. Employer's Liability Insurance in an amount of at least $1,000,000;
3. Comprehensive Liability Insurance with limits of:
   Bodily Injury, Property Damage and Personal Injury - $1,000,000 each occurrence, $1,000,000 aggregate.

   This insurance shall be on an occurrence basis and shall protect the Contractor against liability arising from: his operations, operations by sub-contractors, elevators, products, completed operations and contractual liability assumed under the indemnity provisions above insurance.
4. Automobile Liability on an occurrence basis covering all owned, non-owned, and hired automobiles for limits of liability of:

   Bodily Injury and Property Damage - $1,000,000 each occurrence; and

5. Builder's Risk Insurance is required.

These limits shall be considered sufficient for the contractor associated with this project, provided however, that the limits of such insurance shall not limit the extent of such assumed responsibility and liability.

Deliverables to DWR – Pixley ID will deliver and submit the District's Labor Compliance Program to DWR. This program will be adhered to through the project in all dealings with the retained contractors and their personnel as well as Pixley ID employees accomplishing any portions of the project work. Also, all contracts signed by Pixley ID for contracted construction services will be supplied to DWR for verification that they are consistent with the California Labor Code.

8.3.1.2Task 3 - Reporting

Pixley ID staff will undertake the reporting effort for the 2012 Groundwater Banking Support Project and will work to provide required materials to DWR consistent with what is outlined in this grant application and with the contract that Pixley ID will sign as proposing agency for this Local Groundwater Assistance grant with the State of California. Reporting, accounting, and administration will regularly be evaluated at monthly project meetings between the Pixley ID Project Manager, Pixley ID staff working on the project, consultants working for Pixley ID, and selected contractors. At these meetings progress, progress reports will be generated by the group that include site pictures of recent progress being made, and applicable construction logs will be included if available.

Pixley ID will also generate reporting of project progress to the District's Board of Directors on a monthly basis and to the Deer Creek and Tule River Authority Board of Directors when they meet.

Deliverables to DWR – Pixley ID will deliver quarterly progress reports as well as annual and final reports to DWR for this project. These reports will include a description of progress to date and data developed or information gained, costs incurred, and problems encountered or potential benefits identified as a result of the planned project. Each report will be prepared in accordance with the required DWR format. Within these reports site pictures of progress will be included, applicable construction inspection logs, and project team meeting agendas and minutes.

8.3.2 Task 4 – Agreement with Landowners for Use of 20 Ag/Monitor Wells

Pixley ID will work with landowners in the area of the potential groundwater banking project to add an additional 20 existing irrigation wells to the District's groundwater monitoring network. Agreement for long-term access and use of data generated will be obtained from each well owner.

8.3.3 Planning/Design/Engineering/Environmental Documentation

There has been a significant amount of analysis and evaluation associated with the groundwater banking project, but there has been no engineering design associated with the development of new groundwater monitoring wells. Such design is included as part of this project. Related to the development of a numeric groundwater model, a groundwater conceptual model has been developed as well as the needed water balance and geologic data sets for a numeric groundwater model.

8.3.3.1Task 5 – Preliminary Biological Assessment

District staff would contract with local certified biological consultant to perform a preliminary biological assessment of the conceptual project at the proposed locations for the development of dedicated groundwater monitoring wells. It will be the District's intention to locate these facilities in non-sensitive habitat areas, but any areas of concern will be identified in an effort to protect them in later design efforts.

Deliverables to DWR – Pixley ID will deliver the Preliminary Biological Assessment as a technical studies conducted in support of the monitor well design. Four printed copies of each report will be provided to DWR as well as one digital copy containing all printed material in the report. These reports will be provided to DWR within 30 days of being finalized and accepted by Pixley ID.

8.3.3.2Task 6 – Design of Dedicated Monitor Wells

Pixley ID staff has contracted with a local Civil Engineering consultant to generate the design of dedicated monitor wells for the PIXID Groundwater Banking Support Project. The design will include:

- A design memorandum;
- Construction drawings developed and executed by a registered Civil Engineer in the State of California;
- Project specifications development and executed by a registered Civil Engineer in the State of California;

- Competitive bid solicitation documents; and
- Contract documents based on the District legal requirements.

Task 6.1 – Design Memorandum: A design memorandum will be prepared based upon an understanding of the hydrogeologic setting and groundwater flow conditions under the potential banking area. The facility design will include: drilling methods, monitoring well depth and borehole diameter, screen lengths and intervals, gravel/sand pack intervals, and sealing materials and intervals. The design memorandum will build upon the conceptual groundwater model previously developed for the potential groundwater bank.

Task 6.2 – Construction Drawings: Construction drawings will be developed for the new monitor wells that will provide valuable information on the effectiveness of local groundwater recharge efforts. The proposed facility would be designed to be safely operated and would take into account any sensitive habitat locations identified in the project's Preliminary Biological Assessment. Construction drawings will contain monitoring well location, grading plan, details for well construction, and miscellaneous details about the metal housing to protect and secure the monitoring well. The construction drawings will be consistent with OSHA requirements for this type of facility and will incorporate standard safety features for Pixley ID ditchtenders for consistency with other District facilities.

Task 6.3 – Project Specifications: Each specification section will be developed for the work included in the project and will include a description of the work covered in each section, will reference applicable product and industry standards applicable to the work, will specify who is responsible for applicable safety plans; will outline the process of submitting product information to the project Engineer for acceptance, will outline quality assurance measures for the applicable work, will specify the acceptable procedures for installation of the specified work, will address plausible construction issues encountered during construction, and will define acceptable tolerances for the accomplished work.

Task 6.4 – Solicitation and Competitive Bid Documents: The following solicitation and competitive bid document sections are envisioned as necessary to be included in the contract documents:

- Section 00100 – Instructions to Bidders
- Section 00101 – Requests for Bids
- Section 00305 – Bidder's Checklist
- Section 00310 – Bidder's Proposal
- Section 00313 – List of Subcontractors
- Section 00314 – Material Suppliers Information

- Section 00315 – Preliminary Construction Schedule
- Section 00316 – Non-Collusion Affidavit
- Section 00317 – Public Contract Code Section 10162 Questionnaire on Disqualification
- Section 00318 – Public Contract Code Section 10232 Statement on Contempt
- Section 00324 – Worker's Compensation Certification
- Section 00329 – Labor and Other Code Requirements Certificate
- Section 00340 – Qualification Statement
- Section 00501 – Contract Agreement
- Section 00502 – Indemnity Agreement
- Section 00503 – Guaranty
- Section 00600 – Bond Requirements
- Section 00601 – Bid Bond
- Section 00603 – Performance Bond
- Section 00604 – Payment Bond
- Section 00675 – Notice of Award
- Section 00680 – Notice to Proceed
- Section 00701 – Dispute Resolution, Suspension and Termination
- Section 00900 – Cultural Resources
- Section 00910 – Threatened and Endangered Species Compliance

Each solicitation and competitive bid document section will be developed for the work included in the project and will outline the process that contractors must follow to submit a successful qualified bid for the project and what will be required if they are successfully selected. The solicitation and competitive bid documents address California labor code compliance, indemnity requirements, bonding throughout bidding and the project, how Pixley ID will resolve disputes throughout the project, and commitments that the contractor will have to honor because of Pixley ID findings regarding cultural resources and/or endangered species during CEQA proceedings.

Task 6.5 – Contract Documents: The following contract document sections are envisioned as necessary to be included in the contract documents:

- Section 01005 – Specifications
- Section 01011 – Description of the Work
- Section 01013 – Beginning of Work, Time of Completion, Liquidated Damages
- Section 01017 – Materials
- Section 01018 – Contractor's Responsibilities
- Section 01019 – Construction Stakes, Lines, and Grades
- Section 01022 – Changes to the Work
- Section 01025 – Measurement and Payment
- Section 01026 – Waiver and Release Submittals

- Section 01040 – Coordination of Work
- Section 01052 – Engineer's Status during Construction
- Section 01090 – Definitions and Abbreviations
- Section 01200 – Project Meetings
- Section 01300 – Submittal Procedures
- Section 01400 – Quality Control
- Section 01500 – Temporary Facilities
- Section 01502 – Protection of Underground Facilities and Survey Monuments
- Section 01630 – Product Substitutions
- Section 01700 – Contract Closeout

Each contract document section will be developed for the specifics of this project and will outline the administrative arrangements between the District and the contractor. The contract documents address the priority of the parts included in the contract documents if there are conflicts, what will be the penalties if work is not completed as per the agreed to schedule, measurement and payment arrangements for work performed, submittal procedures, product substitutions and necessary steps to close out the contract.

Deliverables to DWR – Pixley ID will deliver project construction drawings signed by a registered Civil Engineer in the State of California, project specifications signed by a registered Civil Engineer in the State of California; Competitive bid solicitation documents, and project contract documents based on District Standards to DWR (four printed copies and one electronic copy). These documents will be provided to DWR within 30 days of being finalized and accepted by Pixley ID.

8.3.3.3Task 7 – Environmental Documentation

Explain the plan for environmental compliance and permitting, including a discussion of the following items: a description of the plan, proposed efforts, and approach to environmental compliance, including addressing any CEQA obligations in connection with the proposal; a listing environmental related permits or entitlements that are needed for the project; and any other applicable permits that will be required. Briefly describe the process and schedule for securing each permit/approval. Discuss necessary local drilling permits and the submittal of Well Completion Reports to DWR. Describe the proposed process for securing each environmental permit and any other regulatory agency approval.

The project currently has no completed environmental documentation. The District staff members are well acquainted with the issues associated with the groundwater banking project property and thus the location of the construction of the new monitoring wells. Given this familiarity, there is a general view by District staff that there will be no

significant environmental issues to contend with through environmental documentation, but that these issues will be similar to the issues for most other District projects rather that something out of the ordinary.

Task 7.1 – Environmental Checklist and Biological Assessment: The District will contract with a local consultant to review the preliminary biological assessment for the conceptual project and update the assessment for the final design of the project. From this assessment the consultant will fill out an environmental checklist, providing reasons for the categories chosen. This documentation will be reviewed by District staff and a determination will be made as to the appropriate environmental document that will be recommended to be pursued for the project. It is anticipated that a Categorical Exemption will be prepared (Class 6 'Information Collection' exemption, Section 15306, or a Class 3 'Small New Facilities' exemption, Section 15303), as it is the desire to locate the monitoring wells in location and in a manner that have no significant environmental impacts. It is believed that this can be accomplished.

Task 7.2 – Development of CEQA Documentation: The District will contract with a local consultant to review the updated biological assessment and environmental checklist for the project and aid the District in developing what is currently assumed to be, at the extreme, a Mitigated Negative Declaration for the project. The project will be evaluated in detail on how it impacts local Agricultural Resources, Air Quality, Biological Resources, Cultural Resources, Hydrology and Water Quality, Noise, Population and Housing, and Transportation and Traffic. This information and analysis will be summarized in an Initial Study. Then a draft CEQA document will be developed and reviewed by District staff. Once District staff is satisfied with this document, it will be reviewed by DWR. Once DWR is satisfied with this draft document it will be considered the final draft. Copies of the final draft will be prepared for circulation to responsible agencies and the public through the state clearinghouse and other District specific locations for public review. A list of responsible agencies will be developed by the District that will be noticed as to the availability of environmental documentation for the project. A Notice of Intent will be developed for the project and will be posted as per District CEQA guidelines and distributed with copies of the final draft for review and comment. CEQA documentation will be distributed to the state clearinghouse with the standard number of copies for distribution, specific copies will be distributed to local responsible agencies; copies will be distributed to the County Clerk's office and a public library as well as one to be held at the District office for public review.

Task 7.3 – Final CEQA Documentation: All comments on the draft final CEQA documentation will be collected and reviewed. Responses to the comments received

will be drafted by the District's consultant and reviewed by District staff. These responses to comments, along with the draft final environmental documentation will be reviewed and considered by the Pixley ID Board of Directors and, given that they agree with the responses, will pass a resolution accepting the environmental documentation. The resolution will authorize the District Manager to file a Notice of Determination for the project with the State Clearinghouse and the County Clerk and to pay the applicable County fees.

Deliverables to DWR – Pixley ID will work with DWR to deliver draft CEQA documentation for DWR staff review and comment prior to the District's distribution of CEQA documents to other responsible agencies. Approved and adopted CEQA documentation, including the environmental checklist and biological assessment, Initial Study, the Notice of Intent adopt the CEQA documentation, proof of transmittal to the state clearinghouse, all received comment letters from responsible agencies and members of the public, responses to issues brought up in the public review process, the resolution accepting the finalized documentation and instructing the District manager to file the Notice of Determination with the county clerk and the state clearinghouse, will be provided to DWR in printed and electronic versions within 30 days of being finalized and accepted by Pixley ID.

8.3.3.4Task 8 – Permitting

The project currently has no permitting accomplished. It appears, however, that permits for the construction of the dedicated monitoring well facilities will be necessary from the County of Tulare.

Task 8.1 – Private Property Access and GW Data Use: The District will be working with landowners in the area of the groundwater banking project to include 20 existing agricultural wells into the District's monitoring well network. Agreements will be established with these landowners regarding long-term access to their facilities and use of the information by the District.

Task 8.2 – Well Driller's Permit: As per Section 4-13-1245 of the Tulare County Ordinance Code, a permit from the County of Tulare is required for the construction of a well. Application for this permit shall be made to the Health Officer. Such application shall be on forms furnished by the Health Officer and shall provide all information pertaining to the project required by the Health Officer. Every application shall be signed by the owner or his authorized designee. The Health Officer may prescribe conditions if he determines that they are required to prevent contamination or pollution of

underground waters. Permit conditions are appealable pursuant to section 4-13-1275 of this Article. A well permit shall be valid for six (6) months from the date of issuance.

Task 8.3 – Well Completion Report: After well construction is completed, the Contractor performing the work will be required to submit a well completion report to the Department of Water Resources.

Deliverables to DWR – Pixley ID will deliver four copies of well driller's permits from Tulare County, private property access and groundwater data use agreements, and well completion reports to DWR. These documents will be provided to DWR within 30 days of being finalized and received by Pixley ID.

8.3.3.5Task 9 – Developing a Numeric Groundwater Model

A description of the proposed numeric groundwater model is provided below to help put the subsequent proposed tasks and subtasks into perspective.

The Reconnaissance Study on Joint Groundwater Bank within Pixley Irrigation District report (Reconnaissance Study, P&P, March, 2008) provided: 1) a comprehensive overview of existing in-lieu and direct recharge capabilities within Pixley Irrigation District (PIXID); 2) identified areas that could be used for potential direct recharge and in-lieu recharge; and 3) means to allow recovery of banked groundwater without adversely affecting PIXID water users. The Reconnaissance Study identified a potential groundwater bank location (Figure 1) and provided preliminary geologic assessments, engineering evaluations and cost analyses for three potential projects. The proposed groundwater banking project includes in-lieu recharge, construction of new direct recharge ponds, recharge along Deer Creek, recharge from seepage losses along the existing canal system, construction of new recovery wells and construction of new conveyance facilities from the recovery wells to the existing distribution system for return to DEID for use or exchange.

The Reconnaissance Study noted that water management opportunities increase when entities share their resources and cooperate to achieve a goal greater than would be possible for the individuals. The benefits derived from these new opportunities cannot be obtained at the expense of others and the Project includes measures to preclude impacts to others in the area, with the guiding principal being that the groundwater bank and recovery wells not adversely impact local groundwater users. In order to protect local groundwater users, the proposed groundwater banking project has been structured to only recover water that has been recharged. In wet years, the newly

proposed direct recharge facility will store banked volumes of water in the aquifer beneath the recharge facility.

This effort will develop a numerical groundwater flow model for the proposed groundwater banking area that will quantify groundwater inflows and outflows, consider seepage, precipitation and available surface water supplies, and also consider existing groundwater pumping in the area (see **Appendix 5 – A**). This numerical groundwater flow model will be calibrated to historical groundwater elevation data in an effort to create a tool that accurately considers and anticipates responses to changes in available supplies and impacts to groundwater levels. Once this modeling tool has been developed, then it can be utilized to evaluate potential impacts of the proposed Project so that Project partners and local growers have a reasonable idea of how Project operations may impact groundwater resources in the Project area. The groundwater model will assess groundwater flow directions and rates and provide estimates of the capture zone of the recovery wells. The changing shape of the groundwater table over time will be simulated as the recharge facilities are operated and recovery wells pumped. Hydrographs of simulated monitoring well locations will provide a history of water levels in the areas affected by the groundwater bank. The extent to which local farming operations benefit from a raised water table will be assessed. Such benefits would include lower pumping costs, increased well yields and improved water quality.

In years when banked water is requested for return, the recovery facilities would recover recharged water. The groundwater model will assist in evaluating restrictions on the amount that can be recovered in any one year and a schedule of recovery limits for successive dry years will protect local groundwater users from potential negative impacts from the proposed groundwater banking project. This modeling effort will also provide a basis for any environmental permitting or CEQA compliance that is undertaken prior to proposed groundwater banking project construction.

The District intends to prepare a 3-dimensional numerical groundwater flow model of the proposed groundwater banking project and vicinity to simulate the response of groundwater to various operational alternatives. The following paragraphs describe the proposed modeling effort in general terms. Specific operational scenarios will be delineated as the model is developed.

In order to meet the model objectives discussed in the previous paragraphs, the groundwater flow model code must meet the following criteria:

- It must be able to simulate 3-dimensional groundwater flow and multi-species solute transport within the model domain,
- It must be well documented and verified against analytical solutions for specific flow scenarios,
- It must be accepted by regulatory agencies,
- It must be readily understandable and usable by others for simulation of future groundwater conditions, and
- It must have a readily available technical support structure.

The model codes MODFLOW-NWT (Niswonger et al., 2011) meets these criteria and are recommended to develop the site model.

MODFLOW-NWT is the latest version of MODFLOW2005, a modular, finite-difference computer code developed by the USGS to simulate three-dimensional groundwater flow (Harbaugh, 2005). The MODFLOW family of codes is well documented in technical literature and is the de facto standard for groundwater flow modeling worldwide. MODFLOW-NWT is a stand-alone version of MODFLOW-2005, including a new Upstream-Weighting Package that treats nonlinearities of a model cell drying and rewetting by use of a continuous function of groundwater head. This allows for the use of the Newton method for unconfined groundwater flow problems. The Newton method is a commonly used method in the earth sciences to solve nonlinear equations, such as for variably-saturated flow equations in an unconfined aquifer. MODFLOW-NWT solves the partial-differential equations that describe three-dimensional groundwater flow by approximating the solution through the finite-difference method, wherein the continuous groundwater flow system is replaced by a finite set of discrete points in time and space. This process leads to a system of linear algebraic equations, which are solved by the computer program to yield values of potentiometric head and groundwater flow velocity at specific locations and at specific points in time.

The proposed model codes will be implemented on a Windows® based platform. To facilitate the preparation and evaluation of each model simulation, AMEC will utilize the graphics pre/post processor GWVistas™ Version 6.xx (GWV) by Environmental Simulations, Inc. (ESI). GWV is a Windows® program that utilizes a graphic user interface (GUI) to build and modify a database of model parameters. The model grid, hydraulic properties, and boundary conditions are input using the GUI and then GWV creates the necessary MODFLOW data input files. The input files generated by GWV are generic (standard) MODFLOW files compatible with USGS MODFLOW-88/96 and/or MODFLOW2000/2005. In-house utilities and Microsoft EXCEL spreadsheets will

also be used to display standard MODFLOW data input files for selected simulations and for post-processing simulation results.

GWV comes supplied with MFNWTWin32, a Windows® based version of MODFLOW2005, compiled by ESI. MFNWTWin32 is a standard versions of MODFLOW2005 optimized to run under the Windows® environment. This version will be utilized for the modeling effort.

GWV will also be utilized to post-process the model simulations. GWV can display the simulated head and concentration results as plan views and cross sections. In plan view, the contour intervals and labels specified by the user and dry cells are denoted by a different color. In cross-section view, the water table surface is also plotted. Most outputs to the screen can be saved in a number of formats (DXF, WMF, PCX, SURFER, etc.) for utilization in other graphics programs.

The lateral boundaries of the model domain must be placed far enough away from the area of interest so that the specified boundary conditions do not unduly influence the simulation results within the area of interest. In this case, the model boundaries should extend away from the recharge basins and recovery wells a distance to where there are little or no impacts from the Project operations. The model grid will be set up as a variable spacing network with two zones of grid spacing initially established. The inner grid area will consist of an approximately 7 by 7mile area centered on the proposed water bank lands (Figure 1). This area will be simulated using an approximately 330 by 330 foot grid spacing (about 2.5 acre spacing) to provide high resolution simulation and evaluation of potential impacts from water banking operations. The outer grid will extend an additional 3 miles around the perimeter of the inner grid and will be simulated using an approximately 1320 by 1320 foot grid spacing (about 40-acre spacing). The outer grid is designed to provide a buffer zone between the boundary conditions and the inner grid area of interest.

Based on a review of available site stratigraphy, six hydrogeologic units have been identified from the surface to a depth of approximately 1,600 feet. These consist of: younger alluvium surficial soils; an older alluvium upper water-bearing zone which generally overlies the Corcoran Clay; the Corcoran Clay (a laterally extensive confining clay); an older alluvium intermediate depth water-bearing zone generally located beneath the Corcoran Clay; the Schenley Sand, a major aquifer; and a lower water-bearing zone. The sediments dip to the west at 50 to 150 feet per mile, with the deeper sediments dipping at a greater angle than the shallower sediments. With the exception of the surface soils, the sedimentary zones important to the Project are shown on the

conceptual block model. These hydrogeologic units will be simulated using no less than five model layers and as many as 11 model layers. The number of model layers will depend on the vertical resolution required to represent wells within the project area of interest.

The model grid will be aligned with the primary direction of groundwater flow and decrease from 1,320 by 1,320 feet around the edges of the model to 330 by 330 feet in the vicinity of the DEID-PIXED Water bank facilities as described above. The proposed model grid consists of 136 rows, 136 columns, and between 5 and 11 layers.

Review of the available data indicates that groundwater elevations have been measured in monitoring wells and production wells within the model domain on approximately a monthly basis since 1996. Based on these measurements, the proposed model will utilize 168 monthly stress periods to simulate the period from January 1996 through December 2009.

The hydrostratigraphic heterogeneity of the aquifer system will be simulated in the numerical model at a scale appropriate for the modeling objectives. The District's consultant proposes to initially populate the model with the aquifer parameters (horizontal hydraulic conductivity, vertical hydraulic conductivity, specific yield, specific storage, porosity) utilized by the USGS for the Central Valley Hydrologic model (USGS, PP 1766). Site-specific data collected various investigation (soil boring logs, geophysical logs, grain-size analysis, aquifer pumping tests, etc.) will be utilized to update the initial parameters estimates. The model parameters estimates will be further refined (within pre-set limits) during the model calibration process to achieve an acceptable level of fit to groundwater levels observed during the period January 1996 through December 2009. The aquifer parameters will only be modified as necessary to improve the calibration of the model to field observations. As such, the model will contain no more complexity than is justified by the available field data and the model objectives.

Below are the anticipated tasks involved in developing the numeric groundwater model:

Task 9.1 – Scoping Meeting with Project Team: Consultants will meet with representatives of the District to refine the scope of the modeling effort, determine what the data needs are, and understand any modifications to the schedule of deliverables. We anticipate that the meeting can be conducted at the Pixley ID offices within 1 week of authorization to proceed.

Task 9.2 – Compile Gathered Data: Consultants will compile the available data for the study area into a database. The database will include: historical precipitation, groundwater elevations, groundwater pumping estimates, surface water deliveries, cropping patterns, Reference Evapotranspiration (ETo), crop coefficients (Kc), etc. These data will be used to develop a water balance for the model domain on a monthly basis for use in the numerical model.

Task 9.3 – Model Development and Calibration: Consultants will develop and calibrate the proposed groundwater flow model in accordance with ASTM Standards and other modeling guidelines. Model development and calibration is a multi-step process as described in the following paragraphs.

Subtask 9.3.1 – Hydrogeological Conceptual Model: Consultants will meet with the Project team to discuss the existing hydrogeologic conceptual model and to determine where refinements of the conceptual model may benefit the proposed groundwater flow model. The purpose of the hydrogeologic conceptual model will be to simplify field conditions and organize the associated field data so that the system can be analyzed more readily.

There are four steps in developing a hydrogeologic conceptual model: (1) define the model domain, (2) define the hydrostratigraphic units, (3) prepare a water budget, and (4) define the groundwater flow system. Boring logs, geophysical logs, and well construction details (from both older and new wells) are available in electronic format. The use of electronic data sets will simplify preparation of the hydrogeologic conceptual model and numerical model.

Subtask 9.3.2 – Numerical Model Setup and Transient Calibration: Consultants will prepare a numerical groundwater flow model of the proposed DEID-PIXID water banking facility and vicinity using MODFLOWNWT. Consultants will utilize GWVistas™, a pre- and post-processor for MODFLOW, to discretize the hydrogeologic conceptual model data and prepare input files for the numerical model.

As described above, it is anticipated that the model domain will be larger than the water banking facility in order to push the numerical model boundaries sufficiently away from the area of interest. It is anticipated using a relatively fine grid area of about 2.5-acres in the vicinity of the water bank recharge basins, expanding the grid size outward towards the model boundaries and using five to eleven model layers to represent the sub surface stratigraphy. Vertical discretization into model layers will be dependent on the quality of the available data and the level of vertical resolution required by the

project. The model will also incorporate significant hydrogeologic features which may fall within the model domain such as water delivery canals, streams, etc.

The numerical groundwater flow model will be calibrated in transient mode to historical groundwater levels, recharge, and pumping beneath the proposed water bank and vicinity. It is anticipated calibrating the groundwater flow model over a 13-year period from 1996 through 2009 using monthly stress periods. The accuracy of the transient calibration will be dependent on the number and length of model stress periods, the accuracy of the discharge to land and pumping data, and the availability sufficient observation data. The calibration process will involve iterative modification of aquifer parameters and boundary conditions (within reasonable limits) in order to minimize the residual (difference) between observed and simulated heads at selected observation points. The model aquifer parameters may be further refined utilizing an automated parameter estimate program (PEST) to further reduce the model residuals.

Subtask 9.3.3 – Sensitivity and Uncertainty Analysis: Following calibration of the groundwater flow model, the District's consultants will conduct a sensitivity and uncertainty analysis. The purpose of this analysis is to quantify the reliability of the calibrated model in light of uncertainty in the estimates of aquifer parameters, discharge to land, pumping stresses, and boundary conditions used in the model. The analysis will help identify existing "data gaps" and suggest areas where additional information may be useful in improving model accuracy. The sensitivity and uncertainly analysis involves running the calibrated model numerous times, varying single aquifer hydraulic parameters over the likely range of values for each parameter. Model parameters that can be changed over a large range that do not significantly change the model calibration results are insensitive parameters. Model parameters that can be changed over a small range that significantly change the model calibration results are sensitive parameters.

Subtask 9.3.4 – Numerical Model Verification and Validation: Model verification and validation (V&V) are the primary processes for quantifying and building credibility in numerical models. Verification is the process of determining that a model implementation accurately represents the developer's conceptual description of the model and its solution. Validation is the process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model. Both verification and validation are processes that accumulate evidence of a model's correctness or accuracy for a specific scenario; thus, V&V cannot prove that a model is correct and accurate for all possible scenarios, but,

rather, it can provide evidence that the model is sufficiently accurate for its intended use.

Prior to model calibration, approximately 20 to 25 percent of the groundwater elevation data available for calibration will be reserved for model V&V (i.e. the model will be calibrated using only 75 to 80 percent of the available data). After model calibration has been completed, the model will be verified and validated by comparing the reserved V&V data set to the calibrated model simulation results. If the model is well calibrated, the residual between the reserved V&V data set observations and the simulated heads will be approximately the same as for the calibration observation data set, thus validating the model calibration.

Subtask 9.3.5 – Predictive Simulations: Following model calibration, the District's consultants will conduct up to three predictive simulations to evaluate the potential impact(s) of proposed water banking operations on groundwater levels beneath and in the vicinity of the proposed Groundwater Banking project facilities. These predictive simulations will include: (1) 10,000 af/y recharge and recovery, (2) 20,000 af/y recharge and recovery, and 3) 30,000 af/y recharge and recovery. Additional or alternative operations scenarios may be developed in consultation with the Project team.

Each predictive simulation will be run by adding the proposed recharge and recovery to the calibrated model and re-running the simulation. The difference between the predictive simulation heads and the calibrated model heads will be a measure of the impacts of the proposed recharge and recovery on the aquifer system. The impacts will be visualized using simulated hydrographs at selected observation wells and map views of the differences in groundwater elevations.

Task 9.4 Model Documentation: Consultants will maintain a journal of the model setup and simulation runs during this task in accordance with ASTM International (ASTM) standards. The journal will document the purpose of each simulation, the results of the simulation, and recommended modifications for the subsequent simulation. The purpose of the journal is to facilitate reconstruction of each simulation (should that become necessary), reduce calibration time, and facilitate report preparation.

Subsequently, following completion of the modeling, a model report will be prepared in accordance with ASTM standards and other guidance. Descriptions of the model and the modeling results will be presented in a report submitted to DWR. The model report will include a summary of the conceptual hydrogeologic model, the calibrated groundwater flow model parameters, the groundwater flow model sensitivity and

uncertainty analysis, the groundwater flow model validation analysis, and a summary of predictive simulation results.

Finally the report and the model results will be presented to the District Board of Directors and also to at a public meeting for local landowners and other interested parties.

Deliverables to DWR – Pixley ID will deliver presentation materials developed to share the results of the numeric model with the Pixley Board of Directors and local landowners. Also four copies of the model report will be provided to DWR as well as meeting minutes from the presentations to local landowners.

8.3.3.6Task 10 – GPS Survey of Additional Ag/Monitor Wells

Task 10.1 – Selection of Preferred Locations: District staff and consultant will review the District's information on the located ag wells in a 3-mile radius around potential groundwater banking project site. This review will consider land ownership, access to the site, any known information about the depth and condition of the well, and any information regarding monitoring access that is available. Based on the available information and the location of wells already in the District's groundwater monitoring network, 20 preferred ag wells will be preliminarily selected for inclusion. A list will be generated of the 20 preferred wells, the State Well ID's, the District's GPS coordinates for the wells, the owner of the well and the owner's contact information.

Task 10.2 – Selection of alternative ag/monitor wells if necessary: It is possible that a few of the first set of preferred well owners will choose not to allow their wells to be monitored by the District. If this occurs then the District and its consultant will reevaluate the remaining available wells in the area and select a set of alternative wells to be pursued. This effort would be repeated until a total of 20 ells were found that could be included in the District's monitoring well network.

Task 10.3 – GPS Survey of authorized ag/monitor wells: survey control locations were previously established throughout the DCTRA using Fast Static global positioning system (GPS) methods under the guidance of a Licensed Professional Surveyor. Physical control points (brass or aluminum disks) were placed in permanent structures (i.e. District facilities), or placed in cement with rebar when existing structures were not available. Controls were tied to the existing regional High Precision Grid Network (Geoid 03, CA State Plane Zone IV, NAVD 88). The establishment of the control network allows for high precision survey of wells and any other facilities within the

network. Control points were set approximately five miles apart to allow adequate GPS survey anywhere within the control network.

Real-Time Kinematic GPS survey methods will be used to capture the addition well site locations and elevations. This type of survey is necessary to establish an accurate vertical elevation for all wells, on the same datum. The established control network will be utilized to set base stations providing GPS error correction. District staff will guide consultant personnel to each well site that will be surveyed. Consultant staff will collect GPS shots at each well site and will typically be taken on a hard permanent surface. The well pad is the most common shot location, but some shots may have to be taken on the ground surface. Measurements from the shot location to the measure point and ground surface will be collected.

Reference points will be selected by District personnel. Ground surface and measure point elevations will be calculated in the well database developed from the survey information. During the survey, specific attributes about each well will be collected. These attributes are incorporated into the Geographic Information System (GIS). A list of attributes will be provided for review prior to the survey. A photo will be taken of each well site. The existing DCTRA base map will be plotted with the new surveyed well locations. Each well will be labeled with an identifier that will correspond to a printed spreadsheet with well attribute information.

Task 10.4 Update of previous documentation of Monitoring Network wells – The DCTRA has a previous document that summarizes the available information on each well in the monitoring well network. This document includes locations, photos, information on the surveyed reference locations, contact information for well owners and the GPS coordinates for each well. This document will be revised to include the newly developed information for the wells that will be added to Pixley ID's monitor well network.

Deliverables to DWR – Pixley ID will deliver four copies of the updated monitor well network documentation report to DWR.

8.3.4 **Construction/Implementation**

8.3.4.1Task 11 – Construction Contracting and Deliverables

There has been no construction contracting work accomplished for the project to date. The tasks listed below will be accomplished for two new monitoring wells as part of the project after it is selected for grant funding.

Task 11.1 – Publish Notice to Bidders: A notice to bidders will be published in a local newspaper publication on the same day of the week for three successive weeks. This notice will provide the official title for the project and briefly describe the worked sought from bidding contractors. It will also present the location where bids shall be submitted as well as the date and time when bids will be publicly opened and read. The notice will describe the required conditions of the bid packet for acceptance and will describe the required mandatory pre-bid meeting's date, time and place. The notice shall describe where bidding condiments can be acquired and how much they will cost. Further the notice shall describe to bidders that prevailing wages will be required for the job, that a bidder's bond in the amount of 10% of the base bid is required and the required contractor's license classification for the project.

Task 11.2 – Pre-Bid Meeting and Addendum No. 1: As part of the public bid solicitation process, the District will conduct a mandatory pre-bid meeting with interested contractors to go over information in the construction documents and answer questions submitted by contracts. An attendance list will be generated for the meeting and detailed minutes will be taken of all discussions during the meeting. The attendance list from this meeting, the questions asked at this meeting and the responses to these questions will be summarized in one document that will become Addendum Number One to the Contract Documents and will be distributed to all plan holders and contractors that were present at the pre-bid meeting.

Task 11.3 – Bid Opening and Bid Evaluation: An attendance sheet will be kept for the bid opening. The project engineer, his representative or the District engineer will keep the official clock as to when the time for acceptable bid submittals has passed. After that time has been declared, all submitted bids will be collected, will be opened and the submitting contractor and total bid amount and will be read aloud to those present. Then this meeting will be closed and the project engineer, his representative or the District engineer will begin evaluating the submitted bids. The contractor's license, the bond amounts, the bond rating of the issuing company, the insurance and the contractor's history of claims, the math involved in the bid proposal, the preliminary project schedule, the subconsultants listed, similar project experience, listed references, as well as the certifications and required forms will all be checked against what was required in the contract documents. A summary of this evaluation of bids will be generated for the District staff and the Board of Directors to consider.

Task 11.4 – Bid Award: After the selection of the successful bidder for the project by the District's Board of Directors, project engineer, his representative or the District engineer will prepare the Notice of Award for submittal to and signature from the

selected contractor. The project engineer, his representative or the District engineer will work to issue and have signed all remaining documents within the contract and review, receive and verify all project bonding and comment and eventually approve all product submittals and submitted plans. Prior to the contractor moving any equipment to the site, it will be re-visited by the biological consultant to verify that conditions have not changed since it was originally evaluated. Also a flier will be produced for the contractor regarding any cultural resource or sensitive species issues that need to be kept in mind during construction and regularly checked. After this is accomplished, the project engineer, his representative or the District engineer will issue the Notice to Proceed. This notice will officially begin the contractor's allowable timeframe for the construction of the facility.

Deliverables to DWR – Pixley ID will deliver the project's advertisement for bids from a local publication, the agenda and minutes from the pre-bid contractors meeting, information regarding the evaluation of bids submitted to the District, and information and documentation on the award of all construction contracts to DWR. These documents will be provided to DWR within 30 days of being finalized and received by Pixley ID.

8.3.4.2Task 12 – Construction

There has been no construction work accomplished for the project to date. The tasks listed below would be accomplished as part of the project after it is selected for grant funding.

8.3.4.2.1 Subtask 12.1 – Mobilization and Site Preparation

Subtask 12.1.1 – Mobilization: This work task will include the mobilization for all demolition, construction and site work authorized under the construction contract and all necessary equipment and materials to the project site. Once mobilization has begun, the contractor will assume responsibility for project site security. This work item also includes obtaining the required insurance and securing all necessary licenses, permits, preparations of plans, and paying any potential permit fees for the entire project. This work task will also include contacting Underground Services Alert for a review and marking of the project site for existing utilities.

Subtask 12.1.2 – Worker Protection: This work item includes provisions for protection of workers from any hazards that may occur during execution of the work at all times, including but not limited to weekends, holidays, and non-working hours. This work item

will include providing, as necessary, all shoring, sheeting and bracing for trench and excavation stabilization and safety.

Subtask 12.1.3 – Miscellaneous Facilities and Operations: This work item includes provisions for de-watering, maintaining drainage, traffic control, construction and removal of temporary security fencing, construction of staging areas, protection of existing facilities, general project clean up, and all costs for miscellaneous work shown and described in the Contract documents that is not included in other work items. Also this work item includes provision of all necessary facilities for the contractors employees to work on-site in compliance with State labor Code, such as portable bathroom facilities.

8.3.4.2.2 Subtask 12.2 – Project Construction

Subtask 12.2.1 – Construction Staking: Construction stakes will be provided by the District's consultant to the contractor upon request to verify the property boundaries in the location of construction.

Subtask 12.2.2 – Miscellaneous Engineering Services: Questions regarding specifications, design or consulting are common during construction activities. It is envisioned that District staff will need to have the project engineer or his representative available to answer any questions as they arise. The project engineer understands that time is a critical element in order to complete all construction activities for the Project and that communication may be made available during all construction activities.

Subtask 12.2.3 – Monitor Well Construction: This work task will construct two monitor wells at the Groundwater Banking project site. The monitor wells will be drilled by a qualified well driller with experience in construction of monitor wells. It is anticipated that the following requirements will be included,

- Experience – The Contractor shall have at least 5 years experience in drilling wells to depths of at least 100 feet using the drilling, construction and development methods as specified.
- License – The well driller must possess a current C-57 Well Drillers License, valid in the State of California.

The drilling will be performed in Tulare County and the Contractor shall obtain well drilling permits (as noted in Task 7.5) from Tulare County, and shall report the results of the drilling to the California Department of Water Resources. A well completion report will be filed with the California Department of Water Resources.

During drilling, the borehole cuttings will be logged and classified in accordance with the Unified Soil Classification System. Well log information will include date of drilling, type of drill rig, type and diameter of drill bit, type of fluid additives, and depth of boring. Monitoring zones and appropriate well screen intervals will be identified.

Each monitor wells shall be drilled as an 8-inch hole and fitted with a 6-inch diameter, PVC casing, with slots made to allow water to enter the casing. A sanitary seal shall be installed on each monitor well, and an above-ground lockable housing shall be constructed. This housing shall be made of metal and shall be painted for corrosion protection.

Subtask 12.2.4 – E-logs, Geologic and Geophysical Logging: During drilling, the borehole cuttings will be logged and classified in accordance with the Unified Soil Classification System. Well log information will include Stratigraphy, date of drilling, type of drill rig, type and diameter of drill bit, type of fluid additives, and depth of boring. Upon completion of drilling, the boring will be geophysically logged (E-logged) to aid in identifying aquifer and aquitard materials and the depth of occurrence of each. Monitoring zones and appropriate well screen intervals would be identified.

Subtask 12.2.5 – Construction Inspection: The construction inspector will be required to make site visits to the Project site to check on the construction of facilities as per the intended design at critical times, be present at concrete pours to test concrete slump and verify truck tags, and be available for compaction tests. In general it is envisioned that on average two visits per week would be necessary, and that field reports would be generated for each visit.

Subtask 12.2.6 – As-Built Drawings: Changes to the original design would be catalogued through construction and documented through an as-built set of plans for the District's records. As-built drawings shall be completed for the concrete weir structure, the metal catwalk, the control gate, the gauging station, the earthen berms and the new monitor wells.

Deliverables to DWR – Pixley ID will deliver four copies of E-logs, the geologic and geophysical logs, and project as-built drawings to DWR. These documents will be provided to DWR within 30 days of being finalized and received by Pixley ID.

8.3.4.2.3 Subtask 12.3 –Demobilization

This work item includes the work to remove all trash or debris from the project site, complete all items on punch list from the final inspection; remove all equipment, fencing,

project signs and temporary bathroom facilities and to process final payment of project retention and establish start date for the project warranties.

8.3.5 **Environmental Compliance/Mitigation/Enhancement**

Explain the plan for environmental compliance and permitting, including a discussion of the following items: a description of the plan, proposed efforts, and approach to environmental compliance, including addressing any CEQA obligations in connection with the proposal; a listing environmental related permits or entitlements that are needed for the project; and any other applicable permits that will be required. Briefly describe the process and schedule for securing each permit/approval. Discuss necessary local drilling permits and the submittal of Well Completion Reports to DWR. Describe the proposed process for securing each environmental permit and any other regulatory agency approval.

8.3.5.1Task 13 – Environmental Compliance/Mitigation/Enhancement

Based on preliminary results shared by the CEQA compliance consultant for the project, the two new monitoring wells will likely not impact Federal of State protected species or natural communities. However, this task has been developed to mitigate any potential disturbance or impacts to protected species or communities. As previously discussed, the construction of the project's regulation basin will involve the development of new groundwater monitoring wells. Preventative measures will be used during construction to minimize potential impacts to wildlife, including:

- Vehicles should use slow speeds (<15 miles per hour), especially at night, when driving through or around the Project site to minimize potential for striking or disturbing animals. San Joaquin kit fox and other animals are vulnerable to collisions with autos.
- Open pipes and culverts should be inspected before being moved or altered to prevent wildlife from being injured or trapped.
- A pre-construction survey was performed to determine if there was a presence of the San Joaquin Kit Fox or the Swainson Hawk.
- If special status species are encountered during an inspection, they should be left alone to passively exit the area unless otherwise authorized by CDFG or USFWS.
- Any migratory birds and their nests should be not be disturbed as outlined in the Migratory Bird Treaty Act of 1918(MBTA). The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in Section 50 of

the Code of Federal Regulations(CFR) Part 10, including feathers or other parts, nests, eggs or products, except as allowed by implementing regulations (50 CFR 21).

- If building or tree removal must take place during the bird nesting season (February-August) due to construction schedule constraints, pre-disturbance surveys for bird nesting activity should be conducted by a qualified biologist no more than 15 days before tree and building removal. If active nests are located within the construction site, nests should be buffered an appropriate distance as specified by a qualified biologist. Within that buffer no disturbance should occur until after nesting season for the observed species is concluded. Pre-disturbance surveys for bird nesting activity should include the trees on-site, burrows and open buildings (house/garage and shed).

Another mitigation measure requires the District to monitor for cultural resources throughout the construction process. If during the course of the project construction, any archaeological or historical resources are uncovered, discovered or otherwise detected or observed, activities within 50 feet of the find shall be ceased.

8.3.6 **Construction Administration**

8.3.6.1Task 14 – Construction Administration

Prior to construction, District staff will work with the contractor to verify that the material and equipment used in the construction of the new water control structure is consistent with applicable contract document requirements and that material suppliers are identified and approved. District staff will work with the selected contractor to verify that the construction work is accomplished by the contractor as per the contract, that the contractor bills the District appropriately for the work and that warranty of the work is established by date and honored until the agreed upon expiration date has passed. This work will be coordinated with the representative of the District. If unforeseen circumstances are encountered by the contractor, District staff will expeditiously work to make a determination whether the circumstance is a material change to the work described in the contract. If this is determined, the contractor shall be compensated for this change as per District policy.

8.4 Strategy for Evaluating Progress and Performance Project Deliverables for Assessing Progress/Accomplishments

Present a sound strategy for evaluating progress and performance at each step of the proposed project. Project deliverables for assessing progress and accomplishments, which include quarterly progress and final reports.

At regular Project meetings the Project Manager will receive updates on the progress of each Task, its budget, its deliverables and its estimated date of completion. Progress on all these issues will be tracked and recorded by the Project Manager so that a comparison can be made with the original schedule and budget. If during the course of the Project an effort appears to have an issue that needs to be addressed these comparative tools will help the Project Manager identify the issue. Then it will be up to the Project Manager what course of action to take to address the issue and help further the Project so as to complete it on- budget and on-schedule.

8.5 Assurance Granted for Accessing Private Land

If access to private property is needed, provide assurance that access can be granted. For example, if wells will be constructed or sampled on private land, submit a letter or agreement that demonstrates that access for well construction and monitoring on the property has been obtained.

Numeric Groundwater Model – No access to private land will be necessary to accomplish this portion of the Project.

Ag Wells added to Groundwater Monitoring Network – District staff and consultant will review the District's information on the 106 located ag wells within PIXID in a 3-mile radius around potential groundwater banking project site. This review will consider land ownership, access to the site, any known information about the depth and condition of the well, and any information regarding monitoring access that is available. Based on the available information and the location of wells already in the District's groundwater monitoring network 20 preferred ag wells will be preliminarily selected for inclusion. A list will be generated of the 20 preferred ag wells, the State Well ID's, the District's GPS coordinates for the wells, the owner of the well and the owner's contact information.

It is possible that a few of the first set of preferred well owners will choose not to allow their wells to be monitored by the District. If this occurs then the District and its consultant will reevaluate the remaining available wells in the area and select a set of

alternative wells to be pursued. This effort would be repeated until a total of 20 ag wells were found that could be included in the District's monitoring well network.

Two Dedicated Monitor Wells – District staff and consultant will review the District's information on the located ag wells in a 3-mile radius around potential groundwater banking project site. There is a District facility named the Harris Ditch that delivers surface water to this area and it is the District's intention to develop the two new dedicated monitoring wells within the existing Harris Ditch right of way so that right of way acquisition will not be necessary.

PROPOSAL FOR GROUNDWATER MODELING IN SUPPORT OF WATER BANKING ALTERNATIVES

Pixley Irrigation District & Delano-Earlimart Irrigation District
Tulare County, California

Submitted to:
Provost & Pritchard Consulting Group, Visalia, CA

Submitted by:
AMEC Environment & Infrastructure, Inc., Fresno, CA

July 13, 2013

Proposal 2012-025

TABLE OF CONTENTS

FIGURES

PROPOSAL FOR GROUNDWATER MODELING IN SUPPORT OF GROUNDWATER BANKING ALTERNATIVES

Delanio-Earlimart Irrigation District and Pixley Irrigation District
Tulare County, California

1.0 INTRODUCTION

This proposed modeling effort is designed to simulate groundwater flow beneath and in the vicinity of a proposed groundwater banking facility located along Deer Creek in southern Tulare County (Figure 1). The proposed water banking facility would be jointly operated by the Delano-Earlimart Irrigation District (DEID) and Pixley Irrigation District (PIXID). The proposed extraction facilities would recover up to 30,000 acre feet (af) of groundwater per year.

The objectives of the proposed modeling effort are to:

- prepare a groundwater numerical flow model of the proposed DEID-PIXID groundwater banking facility and vicinity;
- calibrate the groundwater flow model to historical groundwater elevation data for the period 1996 through 2009;
- validate model calibration using a sub-set of the historical groundwater elevation data; and
- estimate the potential impacts of groundwater banking and recovery operations on groundwater resources beneath and in the vicinity of the banking facilities assuming three proposed operational scenarios, including:
  - ❖ recharge and recovery of 10,000 af/y,
  - ❖ recharge and recovery of 20,000 af/y, and
  - ❖ recharge and recovery of 30,000 af/y.
  - ❖ Additional or alternative operational scenarios may be run based on initial predictive simulation results

2.0 PROJECT TEAM AND EXPERIENCE

The proposed AMEC Environment & Infrastructure, Inc. (AMEC) project team members for this project have extensive experience in hydrogeologic investigations and preparing numerical groundwater models throughout the Central Valley. The project team members and their experience are described in the following subsection.

2.1 PROJECT TEAM AND QUALIFICATIONS

The key proposed project team personnel consists of David Bean, PG, CHg; Philip Ross, PG; Gary Kramer, PG; and Diana Babshoff. The project team roles are as follows:

David Bean, PG, CHg, will be the Principal in Charge and lead modeler for the project. He will assure that the necessary AMEC resources are provided to complete this project in a timely and cost effective manner. Mr. Bean has 28 years of experience evaluating groundwater resources on a local, regional, and basin scale throughout California and North America. He has utilized field data to develop conceptual hydrogeologic models, prepared detailed water budgets, and estimated yields of wells and aquifers. Many of the studies used analytical and numerical 3-dimensional groundwater flow and contaminant transport models (GWFLOW, MODFLOW, MT3DMS, etc.) to evaluate the fate and transport of chemicals in groundwater. He has also used particle tracking models (MODPATH, Path3D) to optimize the zone-of-capture of remediation wells and evaluate the influence of extraction wells, municipal well fields, and agricultural supply wells on the migration of contaminants in groundwater. Mr. Bean has experience in aquifer testing and data analysis, database design and management, statistical data analysis, report preparation, and regulatory agency interaction.

Philip Ross, PG, will be the Technical Reviewer for the project. He will assure that the project is conducted in a technically sound and defensible manner. Mr. Ross has served in senior technical and management capacities on a multitude of groundwater and surface water projects. His 37 years of professional experience provide substantial expertise in surface and groundwater hydrology, water resources evaluation and development, groundwater modeling, hydrogeochemical evaluation, waste discharge permitting, and groundwater monitoring system design and installation. His duties have included project management, client consultation, regulatory agency interaction, report preparation, supervision of drilling, well installation, groundwater sampling, aquifer testing, surface water measurement and sampling, and data interpretation.

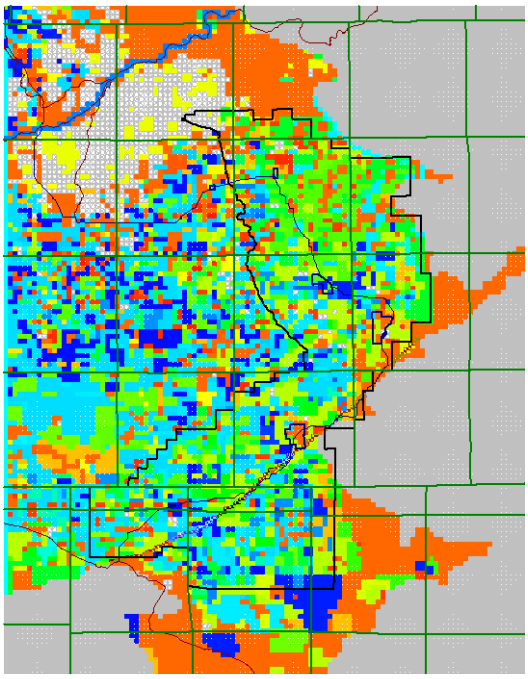
Gary Kramer, PG, will be the assistant modeler for the project. Mr. Kramer has more than 20 years of experience in engineering projects that involve soil and groundwater assessment and remediation and the characterization and development of groundwater resources. He has conducted investigation and remediation projects in California, Nevada, and Utah. He has coordinated investigative site activities that involved drilling soil borings; monitoring well installation, development, and sampling; statistical analysis; and geophysical investigations. Mr. Kramer is experienced in soil logging, hydrogeology, evaluation of groundwater geochemistry, and statistical analysis of groundwater data.

Diana Babshoff will provide geographic information systems (GIS) and database services for the project. Ms. Babshoff's experience includes creating maps, figures, and visualizations for geotechnical and environmental projects. She has successfully applied her GIS knowledge to the production of deliverables for projects including environmental sampling and water resources using ESRI's ArcView GIS. Her GIS experience includes: data acquisition, georeferencing of maps and images, projections, data queries, and data posting. She most recently has added computer aided drafting (CAD) to her work experience, applying CAD knowledge to the production of environmental engineering drawings. Her database skills include: data entry, query development, data import/export, data formatting and data quality assurance/quality control using Microsoft Access. She has 7 years of experience in data compilation and management, project administration, and reporting for projects involving surface water, groundwater, and geotechnical data.

Additional administrative personnel will be utilized as necessary.

2.2 RELEVANT EXPERIENCE

The AMEC team members have worked together on several projects relevant to the proposed modeling effort for DEID-PIXID. All of these projects involved developing and calibrating numerical groundwater flow models at a local, regional, or basin scale, and several involved evaluating the groundwater banking operations throughout the Central Valley. A brief description of these projects is provided in the following paragraphs.



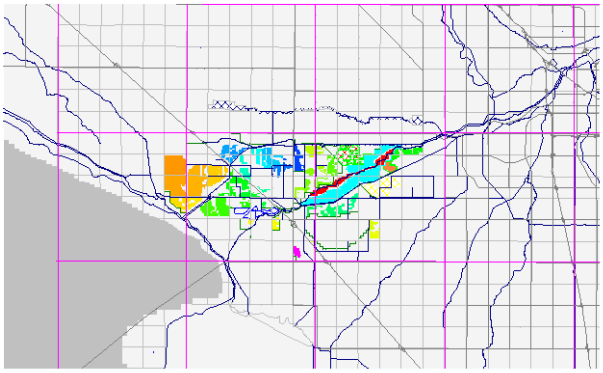
Distribution of Agricultural Demand 1992

Arvin-Edison WSD Model

Arvin-Edison Water Storage District
Arvin, California

The Arvin-Edison Water Storage District (AEWSD) retained AMEC to prepare a water budget and calibrate a MODFLOW2000 numerical groundwater flow model of the AEWSD and surrounding area in Kern County, California. The AEWSD model covers an area of approximately 945 square miles in the southern San Joaquin Valley in California. The model encompasses the AEWSD (~206 square miles) and portions of the adjacent Kern Delta WD, Wheeler- Ridge-Maricopa WSD, and the City of Bakersfield. The San Joaquin Valley is a large structural trough filled with several thousand feet of alluvium derived primarily from the Sierra Nevada to the east and Tehachapi Mountains to the south. The basin dips steeply to the north and west

away from the mountain fronts and towards the Buena Vista Lake bed. Structural controls include the Edison Fault in the north and the White Wolf Fault in the south. The model simulates the period from 1992 through 2008 using 68 quarterly stress periods. Inflow to the model was primarily via mountain front recharge, recharge from the Kern River and streams, leakage from surface water irrigation canals, artificial recharge, over application of irrigation water, and precipitation. Outflow was primarily via 72 recovery wells and 475 agricultural supply wells. Inflows and outflows were balanced in an Excel spread sheet on a quarterly basis and the resulting recharge or discharge arrays were imported into the MODFLOW2000 data set. The model was calibrated to approximately 5,200 water level observations in 246 monitoring and water supply wells within the basin. The model is being utilized to evaluate the potential impact(s) of different recharge and recovery scenarios on groundwater levels beneath the AEWSD and to assist the AEWSD in optimizing future agricultural demand, water supply, and water banking operations.

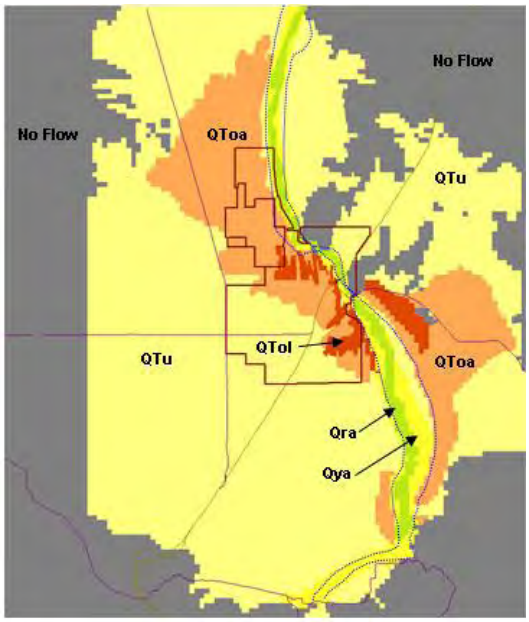


Surface Water Conveyances and Recharge Basins

Kern River Alluvial Fan Model

Kern Water Bank Authority
Bakersfield, California

KWBA has retained AMEC to develop a regional scale groundwater flow model to evaluate artificial recharge and recovery pumping operations on the Kern River Alluvial Fan. The model utilizes MODFLOW2000 and MODPATH to evaluate the impacts of the infiltration of over 900,000 acre-ft of applied water on groundwater levels beneath 75 recharge basins spread over a 13 square mile area. The model is an update of a 1995 modeling effort by the DWR. The model domain has been expanded to encompass nearby and adjacent recharge operations by others and the model grid was refined from 1-mile spacing to 2.5 acre spacing in the water bank area. Over 260 geophysical logs were utilized to develop a 3-dimensional model of hydraulic conductivity distribution in the upper 1,000 feet of the alluvial aquifer. The model simulates the period from October 1988 through December 2011 using 217 semi-annual and quarterly stress periods. Inflow to the model was primarily via intentional recharge in over 70 basins and regional precipitation. Outflow was primarily via 678 recovery wells and water supply wells. The model was calibrated to over 21,000 water level observations in 165 monitoring and water supply wells within the model domain. In addition, the model was verified against a target data set not used in the calibration process which consists of 5,700 observations of heads in 56 groundwater supply wells randomly distributed through the model domain. The model has been used to evaluate the benefits of the water banking projects on the Kern River Alluvial Fan.



Surficial Geology and Mojave River

Upper Mojave River Basin Model

Victor Valley Water District
Victorville, California

The Victor Valley Water District (VVWD) retained AMEC to prepare a water budget and calibrate a numerical groundwater flow model of the Upper Mojave River Basin, San Bernardino County, California. The Upper Mojave River Basin model covers an area of approximately 800 square miles and encompasses most of the Alto subarea and Alto Transition Zone groundwater subbasins within the Mojave River Basin. The model encompasses the Victor Valley Water District (~55 square miles) and portions of the adjacent Apple Valley Ranchos Water District, Baldy Mesa Water District, and the Cites of Adeanto and Hesperia. The Alto subarea and Alto Transition Zone form a large (~500,000 acres) basin filled with alluvium and debris flows derived from the San Gabriel and San Bernardino Mountains to the south, the Shadow Mountains to the west, and the Silver Mountains to the East. The basin dips steeply to the North and towards the Mojave River Channel with over 5,000 feet of relief from the San Bernardino Mountains to the outlet of the Mojave River at the northern edge of the model domain. The model simulates the period from 1980 through 2004 using 100 quarterly stress periods. Inflow to the model was primarily via mountain front recharge reaches, the Mojave River (intermittent stream), and deep percolation of irrigation water, septic systems, and waster water treatment plants. Outflow was primarily via 376 wells including 42 municipal water supply wells and stream discharge from to Mojave River. The model was calibrated to over 5,300 water level observations in 47 monitoring and water supply wells within the basin. The purpose of the model is to simulate groundwater flow in the vicinity of the VVWD under various production and recharge scenarios, to evaluate groundwater in storage, and to evaluate the impact of artificial recharge to local groundwater. Specifically, modeled scenarios included 3 percent (%) and 7% growth in groundwater demand (pumping) with and without artificial recharge. The model was used to estimate: (1) the “safe yield” of the aquifer system beneath the VVWD service area, (2) the time remaining to depletion of existing supply wells (with and without artificial recharge), (3) useful storage capacity available in the aquifer system, (4) flow into the VVWD service area from the south, (5) travel times for recharged surface water to reach the nearest pumping wells, and (6) groundwater mounding effects resulting from artificial recharge. As part of the study, the estimated percentage of VVWD delivered water that goes back into the ground as return flow was also calculated.

3.0 PROJECT UNDERSTANDING

The *Reconnaissance Study on Joint Groundwater Bank within Pixley Irrigation District* report (Reconnaissance Study, P&P, March, 2008) provided: 1) a comprehensive overview of existing in-lieu and direct recharge capabilities within Pixley Irrigation District (PIXID); 2) identified areas that could be used for potential direct recharge and in-lieu recharge; and 3) means to allow recovery of banked groundwater without adversely affecting PIXID water users. The Reconnaissance Study identified a potential groundwater bank location (Figure 1) and provided preliminary geologic assessments, engineering evaluations and cost analyses for three potential projects including the recharge and recovery of 10,000, 20,000, and 30,000 af/y.

The conceptual groundwater banking project (Project) includes in-lieu recharge, construction of new direct recharge ponds, recharge along Deer Creek, recharge from seepage losses along the existing canal system, construction of new recovery wells and construction of new conveyance facilities from the recovery wells to the existing distribution system for return to DEID for use or exchange.

The Reconnaissance Study noted that water management opportunities increase when entities share their resources and cooperate to achieve a goal greater than would be possible for the individuals. The benefits derived from these new opportunities cannot be obtained at the expense of others and the Project includes measures to preclude impacts to others in the area, with the guiding principal being that the groundwater bank and recovery wells not adversely impact local groundwater users. In order to protect local groundwater users, the Project has been structured to only recover water that has been recharged. In wet years, the newly proposed direct recharge facility will store banked volumes of water in the aquifer beneath the recharge facility.

This proposal describes a proposed numerical groundwater flow model for the Project area that will quantify groundwater inflows and outflows, consider seepage, precipitation and available surface water supplies, and also consider existing groundwater pumping in the area. This numerical groundwater flow model will be calibrated to historical groundwater elevation data in an effort to create a tool that accurately considers and anticipates responses to changes in available supplies and impacts to groundwater levels.

Once this modeling tool has been developed, then it can be utilized to evaluate potential impacts of the proposed Project so that Project partners and local growers have a reasonable idea of how Project operations may impact groundwater resources in the Project area. The groundwater model will assess groundwater flow directions and rates and provide estimates of the capture zone of the recovery wells. The changing shape of the groundwater table over

time will be simulated as the recharge facilities are operated and recovery wells pumped. Hydrographs of simulated monitoring well locations will provide a history of water levels in the areas affected by the groundwater bank. The extent to which local farming operations benefit from a raised water table will be assessed. Such benefits would include lower pumping costs, increased well yields and improved water quality.

In years when banked water is requested for return, the recovery facilities would recover recharged water. The groundwater model will assist in drawing up restrictions on the amount that can be recovered in any one year and a schedule of recovery limits for successive dry years will protect local groundwater users from potential negative impacts from the Project. This modeling effort will also provide a basis for any environmental permitting or CEQA compliance that is undertaken prior to Project construction.

4.0 PROJECT APPROACH

AMEC proposes to prepare a 3-dimensional numerical groundwater flow model of the proposed DEID & PIXID groundwater bank and vicinity to simulate the response of groundwater to various operational alternatives. The following subsections describe the proposed modeling effort in general terms. Specific operational scenarios will be delineated as the model is developed.

4.1 PROPOSED MODEL CODES

In order to meet the model objectives discussed in Section 1.0, the groundwater flow model code must meet the following criteria:

- be able to simulate 3-dimensional groundwater flow and multi-species solute transport within the model domain,
- be well documented and verified against analytical solutions for specific flow scenarios,
- be accepted by regulatory agencies,
- be readily understandable and usable by others for simulation of future groundwater conditions, and
- have a readily available technical support structure.

The model codes MODFLOW-NWT (Niswonger et al., 2011) meets these criteria and are recommended to develop the site model.

MODFLOW-NWT is the latest version of MODFLOW2005, a modular, finite-difference computer code developed by the USGS to simulate three-dimensional groundwater flow (Harbaugh, 2005). The MODFLOW family of codes is well documented in technical literature and is the de facto standard for groundwater flow modeling worldwide. MODFLOW-NWT is a stand-alone version of MODFLOW-2005, including a new Upstream-Weighting Package that treats nonlinearities of a model cell drying and rewetting by use of a continuous function of groundwater head. This allows for the use of the Newton method for unconfined groundwater flow problems. The Newton method is a commonly used method in the earth sciences to solve nonlinear equations, such as for variably-saturated flow equations in an unconfined aquifer. MODFLOW-NWT solves the partial-differential equations that describe three-dimensional groundwater flow by approximating the solution through the finite-difference method, wherein the continuous groundwater flow system is replaced by a finite set of discrete points in time and space. This process leads to a system of linear algebraic equations, which are solved by the computer program to yield values of potentiometric head and groundwater flow velocity at specific locations and at specific points in time (Harbaugh, 2005).

The proposed model codes will be implemented on a Windows® based platform. To facilitate the preparation and evaluation of each model simulation, AMEC will utilize the graphics pre/post processor GWVistas™ Version 6.xx (GWV) by Environmental Simulations, Inc. (ESI). GWV is a Windows® program that utilizes a graphic user interface (GUI) to build and modify a database of model parameters. The model grid, hydraulic properties, and boundary conditions are input using the GUI and then GWV creates the necessary MODFLOW data input files. The input files generated by GWV are generic (standard) MODFLOW files compatible with USGS MODFLOW-88/96 and/or MODFLOW2000/2005. AMEC also utilized some in-house utilities and Microsoft EXCEL spreadsheets to generate standard MODFLOW data input files for selected simulations and for post-processing simulation results.

GWV comes supplied with MFNWTWin32, a Windows® based version of MODFLOW2005, compiled by ESI. MFNWTWin32 is a standard versions of MODFLOW2005 optimized to run under the Windows® environment. This version will be utilized for the modeling effort.

GWV will also be utilized to post-process the model simulations. GWV can display the simulated head and concentration results as plan views and cross sections. In plan view, the contour intervals and labels specified by the user and dry cells are denoted by a different color. In cross-section view, the water table surface is also plotted. Most outputs to the screen can be saved in a number of formats (DXF, WMF, PCX, SURFER, etc.) for utilization in other graphics programs.

4.2 PROPOSED MODEL DOMAIN

The lateral boundaries of the model domain must be placed far enough away from the area of interest so that the specified boundary conditions do not unduly influence the simulation results within the area of interest. In this case, the model boundaries should extend away from the recharge basins and recovery wells a distance to where there are little or no impacts from the Project operations. The model grid will be set up as a variable spacing network with two zones of grid spacing initially established. The inner grid area will consist of an approximately 7 by 7mile area centered on the proposed water bank lands (Figure 1). This area will be simulated using an approximately 330 by 330 foot grid spacing (about 2.5 acre spacing) to provide high resolution simulation and evaluation of potential impacts from water banking operations. The outer grid will extend an additional 3 miles around the perimeter of the inner grid and will be simulated using an approximately 1320 by 1320 foot grid spacing (about 40-acre spacing). The outer grid is designed to provide a buffer zone between the boundary conditions and the inner grid area of interest.

Based on a review of available site stratigraphy, six hydrogeologic units have been identified from the surface to a depth of approximately 1,600 feet. These consist of: younger alluvium surficial soils; an older alluvium upper water-bearing zone which generally overlies the Corcoran Clay; the Corcoran Clay (a laterally extensive confining clay); an older alluvium intermediate depth water-bearing zone generally located beneath the Corcoran Clay; the Schenley Sand, a major aquifer; and a lower water-bearing zone. The sediments dip to the west at 50 to 150 feet per mile, with the deeper sediments dipping at a greater angle than the shallower sediments. With the exception of the surface soils, the sedimentary zones important to the Project are shown on the conceptual block model. These hydrogeologic units will be simulated using no less than five model layers and as many as 11 model layers. The number of model layers will depend on the vertical resolution required to represent wells within the project area of interest.

The model grid will be aligned with the primary direction of groundwater flow and decrease from 1,320 by 1,320 feet around the edges of the model to 330 by 330 feet in the vicinity of the DEID-PIXED Water bank facilities as described above. The proposed model grid consists of 136 rows, 136 columns, and between 5 and 11 layers.

4.3 PROPOSED MODEL STRESS PERIODS

Review of the available data indicates that groundwater elevations have been measured in monitoring wells and production wells within the model domain on approximately a monthly basis since 1996. Based on these measurements, the proposed model will utilize 168 monthly stress periods to simulate the period from January 1996 through December 2009.

4.4 PROPOSED AQUIFER PARAMETERS

The hydrostratigraphic heterogeneity of the aquifer system will be simulated in the numerical model at a scale appropriate for the modeling objectives. AMEC proposes to initially populate the model with the aquifer parameters (horizontal hydraulic conductivity, vertical hydraulic conductivity, specific yield, specific storage, porosity) utilized by the USGS for the Central Valley Hydrologic model (USGS, PP 1766). Site-specific data collected various investigation (soil boring logs, geophysical logs, grain-size analysis, aquifer pumping tests, etc.) will be utilized to update the initial parameters estimates. The model parameters estimates will be further refined (within pre-set limits) during the model calibration process to achieve an acceptable level of fit to groundwater levels observed during the period January 1996 through December 2009. The aquifer parameters will only be modified as necessary to improve the calibration of the model to field observations. As such, the model will contain no more complexity than is justified by the available field data and the model objectives.

5.0 SCOPE OF WORK

The proposed scope of work is discussed in the following subsections.

5.1 TASK 1 – SCOPING MEETING WITH DEID-PIXID AND PROVOST & PRITCHARD TEAM

AMEC will meet with representatives of DEID-PIXID and the Provost & Pritchard (P&P) teams to refine the scope of the modeling effort, determine what the data needs are, and establish a schedule of deliverables. We anticipate that the meeting can be conducted at the Pixley ID offices within 1 week of authorization to proceed.

5.2 TASK 2 – COMPILE AVAILABLE DATA

AMEC will compile the available data for the study area into a database. The database will include: historical precipitation, groundwater elevations, pumping by well, surface water deliveries, cropping patterns, ETo, crop coefficients, etc. These data will be used to develop a water balance for the model domain on a monthly basis for use in the numerical model.

5.3 TASK 3 – MODEL DEVELOPMENT AND CALIBRATION

AMEC will develop and calibrate the proposed groundwater flow model in accordance with ASTM Standards and other modeling guidelines. Model development and calibration is a multi-step process as described in the following paragraphs.

5.3.1 Hydrogeologic Conceptual Model

AMEC will meet with DEID-PIXID and P&P to discuss the existing hydrogeologic conceptual model and to determine where refinements of the conceptual model may benefit the proposed groundwater flow model. The purpose of the hydrogeologic conceptual model will be to

simplify field conditions and organize the associated field data so that the system can be analyzed more readily.

There are four steps in developing a hydrogeologic conceptual model: (1) define the model domain, (2) define the hydrostratigraphic units, (3) prepare a water budget, and (4) define the groundwater flow system. We assume that boring logs, geophysical logs, and well construction details (from both older and new wells) are available in some electronic format. The use of electronic data sets will simplify preparation of the hydrogeologic conceptual model and numerical model.

5.3.2 Numerical Model Setup and Transient Calibration

AMEC will prepare a numerical groundwater flow model of the proposed DEID-PIXID water banking facility and vicinity using MODFLOWNWT. AMEC will utilize GWVistas™, a pre- and post-processor for MODFLOW, to discretize the hydrogeologic conceptual model data and prepare input files for the numerical model.

As described in Section 4.2, we anticipate that the model domain will be larger than the water banking facility in order to push the numerical model boundaries sufficiently away from the area of interest. We anticipate using a relatively fine grid area of about 2.5-acres in the vicinity of the water bank recharge basins, expanding the grid size outward towards the model boundaries. We anticipate using five to eleven model layers to represent the sub surface stratigraphy. Vertical discretization into model layers will be dependent on the quality of the available data and the level of vertical resolution required by the project. The model will also incorporate significant hydrogeologic features which may fall within the model domain such as water delivery canals, streams, etc.

The numerical groundwater flow model will be calibrated in transient mode to historical groundwater levels, recharge, and pumping beneath the proposed water bank and vicinity. We anticipate calibrating the groundwater flow model over a 13-year period from 1996 through 2009 using monthly stress periods. The accuracy of the transient calibration will be dependent on the number and length of model stress periods, the accuracy of the discharge to land and pumping data, and the availability sufficient observation data. The calibration process will involve iterative modification of aquifer parameters and boundary conditions (within reasonable limits) in order to minimize the residual (difference) between observed and simulated heads at selected observation points. The model aquifer parameters may be further refined utilizing an automated parameter estimate program (PEST) to further reduce the model residuals.

5.3.3 Sensitivity and Uncertainty Analysis

Following calibration of the groundwater flow model, AMEC will conduct a sensitivity and uncertainty analysis. The purpose of this analysis is to quantify the reliability of the calibrated model in light of uncertainty in the estimates of aquifer parameters, discharge to land, pumping stresses, and boundary conditions used in the model. The analysis will help identify existing "data gaps" and suggest areas where additional information may be useful in improving model accuracy. The sensitivity and uncertainly analysis involves running the calibrated model numerous times, varying single aquifer hydraulic parameters over the likely range of values for each parameter. Model parameters that can be changed over a large range that do not significantly change the model calibration results are insensitive parameters. Model parameters that can be changed over a small range that significantly change the model calibration results are sensitive parameters. Sensitive model parameters that are poorly constrained by field data may require additional investigation.

5.3.4 Numerical Model Verification and Validation

Model verification and validation (V&V) are the primary processes for quantifying and building credibility in numerical models. Verification is the process of determining that a model implementation accurately represents the developer's conceptual description of the model and its solution. Validation is the process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model. Both verification and validation are processes that accumulate evidence of a model's correctness or accuracy for a specific scenario; thus, V&V cannot prove that a model is correct and accurate for all possible scenarios, but, rather, it can provide evidence that the model is sufficiently accurate for its intended use.

Prior to model calibration, approximately 20 to 25 percent of the groundwater elevation data available for calibration will be reserved for model V&V (i.e. the model will be calibrated using only 75 to 80 percent of the available data). After model calibration has been completed, the model will be verified and validated by comparing the reserved V&V data set to the calibrated model simulation results. If the model is well calibrated, the residual between the reserved V&V data set observations and the simulated heads will be approximately the same as for the calibration observation data set, thus validating the model calibration.

5.3.5 Predictive Simulations

Following model calibration, AMEC will conduct up to three predictive simulations to evaluate the potential impact(s) of proposed water banking operations on groundwater levels beneath and in the vicinity of the DEID-PIXID facilities. These predictive simulations will include: (1) 10,000 af/y recharge and recovery, (2) 20,000 af/y recharge and recovery, and 3) 30,000 af/y

recharge and recovery. Additional or alternative operations scenarios may be developed in consultation with DEID-PIXID and P&P.

Each predictive simulation will be run by adding the proposed recharge and recovery to the calibrated model and re-running the simulation. The difference between the predictive simulation heads and the calibrated model heads will be a measure of the impacts of the proposed recharge and recovery on the aquifer system. The impacts will be visualized using simulated hydrogaphs at selected observation wells and map views of the differences in groundwater elevations.

5.4 MODEL DOCUMENTATION

AMEC will maintain a journal of the model setup and simulation runs during this task in accordance with ASTM International (ASTM) standards. The journal will document the purpose of each simulation, the results of the simulation, and recommended modifications for the subsequent simulation. The purpose of the journal is to facilitate reconstruction of each simulation (should that become necessary), reduce calibration time, and facilitate report preparation.

Subsequently, following completion of the modeling, a model report will be prepared in accordance with ASTM standards and other guidance. Descriptions of the model and the modeling results will be presented in a report submitted to DEID-PIXID and P&P. The model report will include a summary of the conceptual hydrogeologic model, the calibrated groundwater flow model parameters, the groundwater flow model sensitivity and uncertainty analysis, the groundwater flow model validation analysis, and a summary of predictive simulation results.

6.0 SCHEDULE

AMEC can begin as soon as we receive a signed authorization to proceed (ATP). The schedule will depend in large part on the amount of information available and what form the information is in (e.g., paper or electronic). We have the qualified personnel available to move expeditiously on this project. We would suggest a timeline that includes the following:

1. Kickoff Meeting, 1 week after ATP – Attended by key personnel from DEID-PIXID and P&P, and AMEC to determine scope of the modeling effort and what data are available and in what formats.

2. Exchange of Data, during 2 weeks following Kickoff Meeting – DEID-PIXID, P&P and AMEC exchange data and review how much time/effort will be required to upload data and to locate additional outside data (USGS, DWR, TID, etc.).

3. Conceptual Model Review Meeting, approximately 3 months from ATP – A review meeting is suggested to present the findings of the water balance and conceptual hydrogeologic model. We would also present the framework and timeline for the numerical model at this time. Generally, we would expect a numerical model could be done in about 3 months, assuming that the necessary data are readily available.

4. Presentation of Numerical Model Calibration Results, approximately 6 months from ATP – It is anticipated that the results of the numerical model calibration and sensitivity analysis can be presented in a meeting (or via Live Meeting) approximately 3 months following the conceptual model review meeting. If the results are acceptable, AMEC will conduct up to three predictive simulations, which will take approximately 1 month to complete.

5. Presentation of Numerical Model Predictive Simulations, approximately 7 months from ATP – It is anticipated that the predictive simulations results can be presented in a meeting (or via Live Meeting) approximately 1 month following the model calibration review meeting. If the results are acceptable, AMEC will begin drafting model documentation, which will take approximately 2 months to complete.

6. Draft Numerical Model Results Report, approximately 9 months after ATP – A draft model report conforming to ASTM standards and other guidance will be submitted to DEID-PIXID and P&P for review. The draft model report will describe the conceptual hydrogeologic model, model calibration to groundwater flow, sensitivity analysis, and predictive simulation results.

7. Submit Final Numerical Model Results Report – It is anticipated that approximately 2 weeks after receiving comments from DEID-PIXID and P&P (about 10 months after ATP), the final numerical model results report can be submitted to the DEID-PIXID and P&P.

7.0 COST ESTIMATE

AMEC will provide the proposed scope of work to the DEID-PIXID and P&P on a time-and-materials basis in accordance with the 2012 Schedule of Charges (Appendix A), with labor rates discounted 10 percent. Final costs will be dependent upon the agreed scope of work and the amount and format of available data. Based on the level of effort of work proposed and our understanding of DEID-PIXID and P&P needs at this time, we estimate that the project will cost approximately $100,000. These estimates will be refined after the scope of work is finalized and the data availability is better understood.

8.0 REFERENCES

Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p.

Harbaugh, A. W., E. R. Banta, M. C. Hill, and M. G. McDonald, 2000, MODFLOW-2000: U.S. Geological Survey modular ground-water model—User guide to modularization

concepts and the ground-water flow process: U.S. Geological Survey Open-File Report 00–92, 121 p.

Phillips, S.P., C. T. Green, K. R. Burow, J. L. Shelton, and D. L. Rewis, 2007, Simulation of multiscale ground-water flow in part of the northeastern San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2007-5009, 43 p.

EST. 1968
PROVOST & PRITCHARD INC
ENGINEERING GROUP
An Employee Owned Company

WATER & WASTEWATER
MUNICIPAL INFRASTRUCTURE
LAND DEVELOPMENT
AGRICULTURE SERVICES
DAIRY SERVICES
LAND SURVEYING & GIS
PLANNING & ENVIRONMENTAL
DISTRICT MANAGEMENT

FRESNO • CLOVIS • VISALIA • BAKERSFIELD

130 N. Garden Street
Visalia . CA . 93291
559 636-1166
FAX 559 3636-1177
www.ppeng.com

July 9, 2012

Board of Directors
Pixley Irrigation District
c/o Mr. Dan Vink, Manager
357 East Olive Ave.
Tipton, CA 93272

Re: LGA Grant Reporting, Ag Monitor/Well Survey, Environmental Documentation, Plans/Specs/Estimate for Dedicated Monitoring Wells and Construction Related Services

Dear Sirs:

Thank you for the opportunity to propose services related to LGA Grant Reporting, Ag Monitor/Well Survey, development of Environmental Documentation, development of Plans/Specs/Estimate for two Dedicated Monitoring Wells and Construction Related Services. Pixley ID (PIXID) has been a valued client for some time and we are pleased to be able to help serve you regarding this new topic of interest.

LGA Grant Reporting:

It is envisioned that P&P will be involved in assisting with the reporting on the LGA Grant progress to DWR. This would include regular project meetings, undertake contracting for construction services and construction review for the Project; and establishing schedules and evaluating the quality of the project work accomplished. Also this will include the generation of quarterly progress reports to DWR staff, project progress reports to the District's Board of Directors on a monthly basis and to the Deer Creek and Tule River Authority Board of Directors when they meet. This effort will also include the development of draft and final reports to DWR on the completion of the project.

20 Ag/Monitor Wells Included in District Monitoring Well Network:

It is envisioned that District and P&P staff will review the District's information on the located ag wells in a 3-mile radius around potential groundwater banking project site. This review will consider land ownership, access to the site, any known information about the depth and condition of the well, and any information regarding monitoring access that is available. Based on the available information and the location of wells already in the District's groundwater monitoring network 20 preferred ag wells will be preliminarily selected for inclusion. A list will be generated of the 20 preferred ag wells, the State Well ID's, the District's GPS coordinates for the wells, the owner of the well and the owner's contact information.

It is envisioned that the District will begin to contact landowners regarding the inclusion of their wells in the District's groundwater monitoring well network. If there is no immediate resistance to the inclusion of a well, District staff and their consultant will visit each well site to review the condition of the well, attempt to measure the depth to groundwater in the well (sound it), and identify any issues with access or if developing a logical measurement reference elevation would be problematic. The District will also inquire if there are any records on how the well was originally constructed, if the owner has a well drillers report, and if the well has ever been videoed. If there do not appear to be any significant issues with the condition and access to the well then the well will be recommended for inclusion in the network. Landowners who are willing to allow their wells to be monitored will be provided a District form explaining what the District intend to do with the monitoring information, the lines of communication available to the landowner if there are concerns in the future, the procedures and equipment the District will use to monitor the well and the access that the District is requesting to their property and facilities. The District will then work with landowners to address reasonable concerns they may have and attempt to encourage landowners to allow the wells to be included in the monitoring well network.

If it is necessary to communicate with additional landowners beyond the original owners of the 20 preferred wells, then the District would address the owners of selected alternative wells and attempt to communicate with them as previously described. This effort would be repeated until a total of 20 ag wells were found that could be included in the District's monitoring well network.

Through a previous effort, survey control locations were established throughout the DCTRA using Fast Static global positioning system (GPS) methods under the guidance of a Licensed Professional Surveyor. Physical control points (brass or aluminum disks) were placed in permanent structures (i.e. District facilities), or placed in cement with rebar when existing structures were not available. Controls were tied to the existing regional High Precision Grid Network (Geoid 03, CA State Plane Zone IV, NAVD 88). The establishment of the control network allows for high precision survey of wells and any other facilities within the network. Control points were set approximately five miles apart to allow adequate GPS survey anywhere within the control network.

Real-Time Kinematic GPS survey methods will be used to capture the addition well site locations and elevations. This type of survey is necessary to establish an accurate vertical elevation for all wells, on the same datum. The established control network will be utilized to set base stations providing GPS error correction. District staff will guide P&P personnel to each well site that will be surveyed. P&P staff will collect GPS shots at each well site and will typically be taken on a hard permanent surface. The well pad is the most common shot location, but some shots may have to be taken on the ground surface. Measurements from the shot location to the measure point and ground surface will be collected.

Reference points will be selected by District personnel. Ground surface and measure point elevations will be calculated in the well database developed from the survey information. During the survey, specific attributes about each well will be collected. These attributes are incorporated into the Geographic Information System (GIS). A list of attributes will be provided for review prior to the survey. A photo will be taken of each well site. The existing DCTRA base map will be plotted with the new surveyed well locations. Each well will be labeled with an identifier that will correspond to a printed spreadsheet with well attribute information.

The DCTRA has a previous document that summarizes the available information on each well in the monitoring well network. This document includes locations, photos, information on the surveyed reference locations, contact information for well owners and the GPS coordinates for each well. This document will be revised to include the newly developed information for the wells that will be added to Pixley ID's monitor well network.

Environmental Documentation for Dedicated Monitor Wells:

It is envisioned that P&P staff would conduct a preliminary biological assessment of the conceptual project at the proposed locations for the development of dedicated groundwater monitoring wells. It will be the District's intention to locate these facilities in non-sensitive habitat areas, but any areas of concern will be identified in an effort to protect them in later design efforts. There is a general view by District staff that there will be no significant environmental issues to contend with through environmental documentation, but that these issues will be similar to the issues for most other District projects rather that something out of the ordinary.

It is envisioned that P&P staff would review the preliminary biological assessment for the conceptual project and update the assessment for the final design of the project. From this assessment P&P will fill out an environmental checklist, providing reasons for the categories chosen. This documentation will be reviewed by District staff and a determination will be made as to the appropriate environmental document that will be recommended to be pursued for the project. It is anticipated that a Categorical Exemption will be prepared (Class 6 'Information Collection' exemption, Section 15306, or a Class 3 'Small New Facilities' exemption, Section 15303), as it is the desire to locate the monitoring wells in location and in a manner that have no significant environmental impacts. It is believed that this can be accomplished.

Plans/Specs/Estimate for Dedicated Monitoring Wells:

It is anticipated that District staff and consultant will review the District's information on the located ag wells in a 3-mile radius around potential groundwater banking project site. This review will consider the District's existing right of way, the existing facilities on

the site, access to the site, and the potential groundwater banking facility locations. Based on the available information two preferred sites will be selected to be pursued.

A design memorandum will be prepared based upon an understanding of the hydrogeologic setting and groundwater flow conditions under the potential banking area. The facility design will include: drilling methods, monitoring well depth and borehole diameter, screen lengths and intervals, gravel/sand pack intervals, and sealing materials and intervals. The design memorandum will build upon the conceptual groundwater model previously developed for the potential groundwater bank. A licensed engineer or geologist will prepare well design drawings, specifications and technical documents. The wells will be designed in accordance with the California Water Well Standards. A cost estimate will be prepared for comparison of bids.

Construction Related Services:

The construction of the monitor wells will be under the supervision and direction of District staff, with technical support from their consulting engineer and/or geologist as needed. Construction review will be performed under the supervision of a licensed engineer or certified geologist. The District and the engineer will be responsible for insuring the design intent is implemented during the construction phase and will inspect before, during and after construction.

Day-to-day construction inspection services would be provided by District staff. Review of material and equipment submittals, processing monthly payment requests, and negotiating and preparation of contract change orders would be performed by the District's consulting engineer.

During drilling, the borehole cuttings will be logged and classified in accordance with the Unified Soil Classification System. Well log information will include Stratigraphy, date of drilling, type of drill rig, type and diameter of drill bit, type of fluid additives, and depth of boring. Upon completion of drilling, the boring will be geophysically logged (E-log arranged by contractor) to aid in identifying aquifer and aquitard materials and the depth of occurrence of each. Monitoring zones and appropriate well screen intervals would be identified.

Upon completion of construction, well construction information will be documented, including: well depth and diameter, casing diameters, screened intervals, gravel/sand pack intervals and type, sealing intervals and type, and conductor casings and surface completion details. The drawings will be signed by a professional engineer.

For a more in-depth analysis of crop demand over a large area (like a district) there is an alternative methodology called SEBAL (Surface Energy Balance Algorithm for Land) that uses satellite images\data to calculate ET using a modified sensible heat flux approach. Satellite flight information is historically catalogued and satellite flights occur

multiple times through a year. This multiple flight information can be analyzed to evaluate the full impact of multiple cropping across the Districts on a monthly basis. These satellite flight crossings cover many miles wide and could be useful to many different districts throughout the area. This approach would provide increased accuracy over the proposed approach but is expensive for the additional quality of information. We can investigate the costs and benefits further if you feel the proposed approach will not provide to you the quality of information you are looking for.

Schedule

It is anticipated that is project will require approximately 8 months after the authorization to proceed (ATP) from DWR which is expected the beginning of April 2013. Once given the ATP, P&P will immediately begin with several of the project tasks including, design of the two new monitoring wells, selecting preferred locations for the additional ag/monitor wells, preliminary biological assessments and environmental documentation, and aiding the District with landowner agreements.

Design and environmental documentation for the two new monitoring wells is expected to take approximately 4 months from the ATP, and then the project will go out to bid during the next month. After the bid is awarded and a contract is signed with the contractor, construction will begin (expected approximately 6 months after ATP) and is expected to take approximately 1 month. Inspection, construction cleanup, and As-Built drawings will be completed in the 8th and final month after the ATP.

Selection of the preferred 20 ag/monitoring well locations is expected to take 1 month, which will be followed with a GPS survey of each of the well. In the next months the District Monitoring Network will be updated including these 20 new locations and the two newly constructed wells.

Throughout this project P&P will be aiding the District in LGA grant reporting, which is expected to occur quarterly. This project is proposed to be performed on a Time and Materials basis and billed monthly for work actually performed using our then current rate schedule (attached). We will bill PIXID directly. The estimated cost to perform this study is as follows:

Summary: Budgeted Amounts for Proposed Scope of Work	
LGA Grant Reporting	$11,500
20 Ag/Monitor Wells Included in District Monitoring Well Network	$9,000
Environmental Documentation for Dedicated Monitor Wells	$4,000
Plans/Specs/Estimate for Dedicated Monitoring Wells	$34,000
Construction Related Services	$10,500
Project Total	**$69,000**

Job No. 3159-12V1-OGC

It is anticipated that this work will be accomplished as a new phase under PIXID's on-going consulting contracts with P&P. If this proposal is acceptable to you please sign and date the approval line below and return a copy to us at the P&P Visalia office at your earliest convenience. We have appreciated the opportunity to work on this Project and look forward to working with you and your staff on its development. Please feel free to call me if you have any questions.

Very truly yours,

Richard Moss, Vice-president

drm

Approved by:

Dan Vink, Manager of Pixley ID (date)

Dan Vink, Manager of LTRID (date)